AMERICAN MACHINIST

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New Stone Working Machinery.

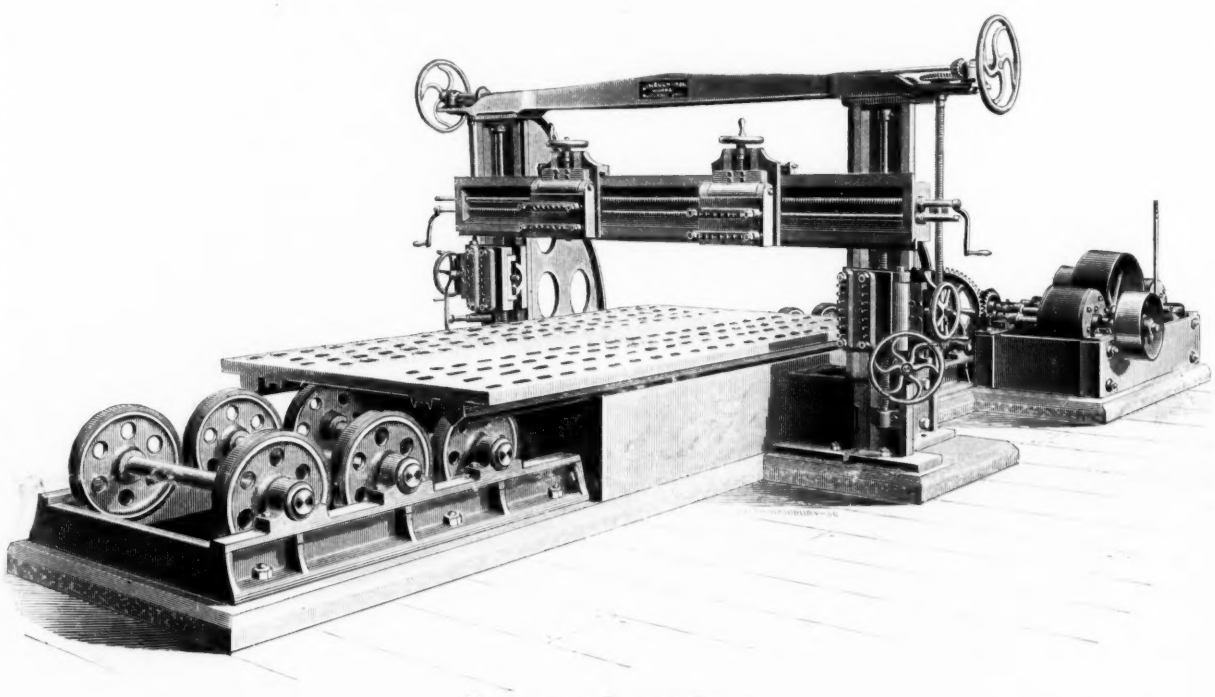
We present with this, two improved stone-working machines, made at the Lincoln Iron Works and Machine Shop, Rutland, Vt. The planing machine is particularly adapted to planing flagging and building stone. It will plane a stone twelve feet long, eight feet wide, and three feet thick.

There are two tool stocks mounted on the cross-head, both of which can be operated from either side of the machine; in addition to these there is a tool stock mounted on each side post. Each tool stock will carry seven tools. The tools may be set to plane a smooth flat surface or, by using tools of the proper shape, moulding flutings on columns, and similar work may be planed. The tool stock when full of tools takes a cut fifteen inches wide. All tool stocks have lateral and vertical motion.

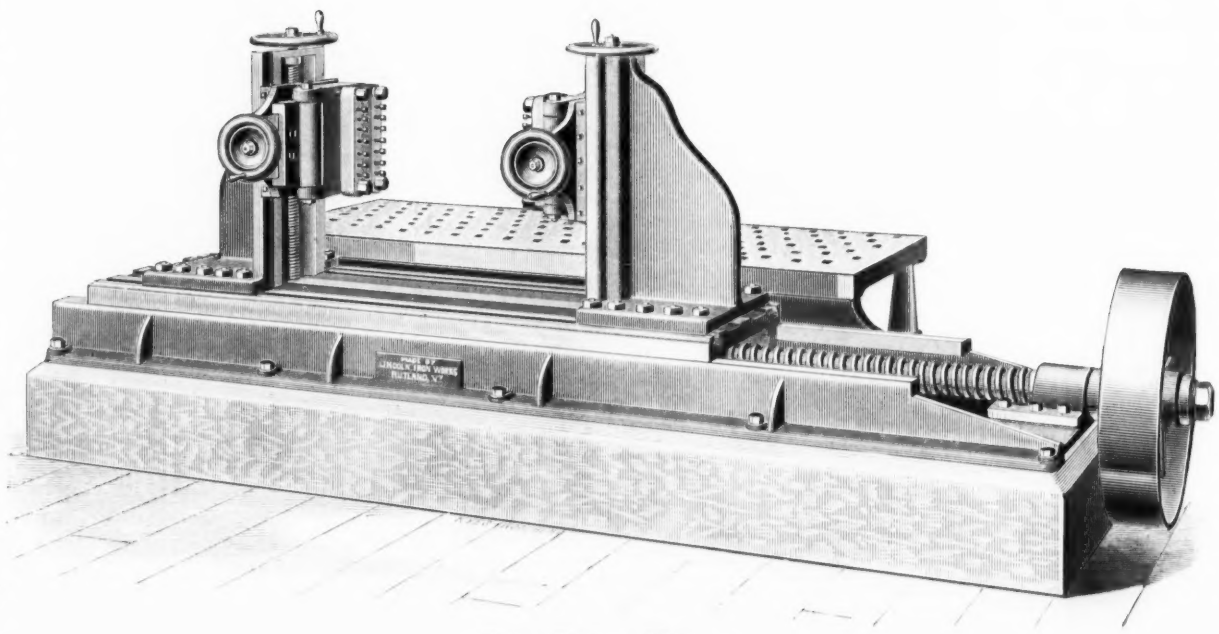
The cross-head is securely gibbed to the posts, so that in heavy cuts it can be rigidly fastened.

The platen is operated by a hammered iron screw, six inches diameter, square threaded, and one and one-half inch pitch. This screw is driven through friction wheels. The platen is $2\frac{3}{4}$ inches thick. It runs in ways under the tools, but on friction wheels at the ends, the rolls being used to reduce friction, and because they are much more easily kept clean. All bearings, so far as practicable are dust proof.

The stone jointing machine is for jointing the ends of work, such as building stones, flagging stones, etc. The platen is operated by a screw, upon one end of which is a friction pulley, driven by friction wheels, running in opposite directions. The tool stocks can be adjusted horizontally and vertically. The uprights are bolted to the movable platen.



MACHINE FOR PLANING STONE.



STONE JOINTING MACHINE.

In operating, the stone is bolted to the fixed table, and one tool moves up to the center, then when this tool backs out the other moves up from the opposite side to a little beyond where the first tool stopped. This method prevents chipping or breaking the edge, as would occur if one tool ran entirely across.

Both these machines appear to be designed and constructed with a care not usually given to machines of this class, with a view to doing first-class work and a good deal of it.

The Lehigh Valley Railroad Locomotive.

Mr. Alexander Mitchell, Superintendent of the Lehigh Valley Railroad at Wilkesbarre, Pa., has recently finished his locomotive, built with the Strong valve gear, and the engine is now in service pulling fast passenger trains. The engine works very well, and Mr. Mitchell is satisfied that she will prove a success, but the matter cannot be settled till comparative trials are made, which will be undertaken when the weather permits. In working her way through heavy snow drifts the engine showed high tractive power and adhesion. The engineer reports that she steams particularly freely compared with others of the same boiler capacity, which is probably due to the smaller quantity of steam used by the improved valve gear providing a superior distribution. The engine is run with scarcely any compression, yet she works smoothly without any pounding in passing the centers. Mr. Mitchell does not believe that the locomotive is yet by any means a perfect engine, and he is not contented to follow established forms blindly without trying to make improvements. He designed the first consolidation engine, and made it a success contrary to the expressed opinions of many leading railroad and mechanical authorities.

Many other important improvements on the minor parts of the locomotive have originated in his works, and his standing motto still is progress.

The performance of the last engine turned out by Mr. Mitchell will do much to settle the much debated question whether or not it is possible to put a valve motion on a locomotive that will give better results than the link motion.

Unbalanced Bodies in Revolution.

BY J. C. HOADLEY.

"I am one of those people who love to be refuted when in the wrong, and also to refute others when they are in error, who, for that matter, take no less pleasure in being set right than in setting others right. I hold, in fact, that the gain in being convinced of error is the greater gain, inasmuch as it is deliverance from the greatest of evils." [Plato, Socrates *loq.* in the Gorgias: freely translated from the French of V. Cousin, Vol. 3, p. 213. Paris, Bossange Freres, 1826.]

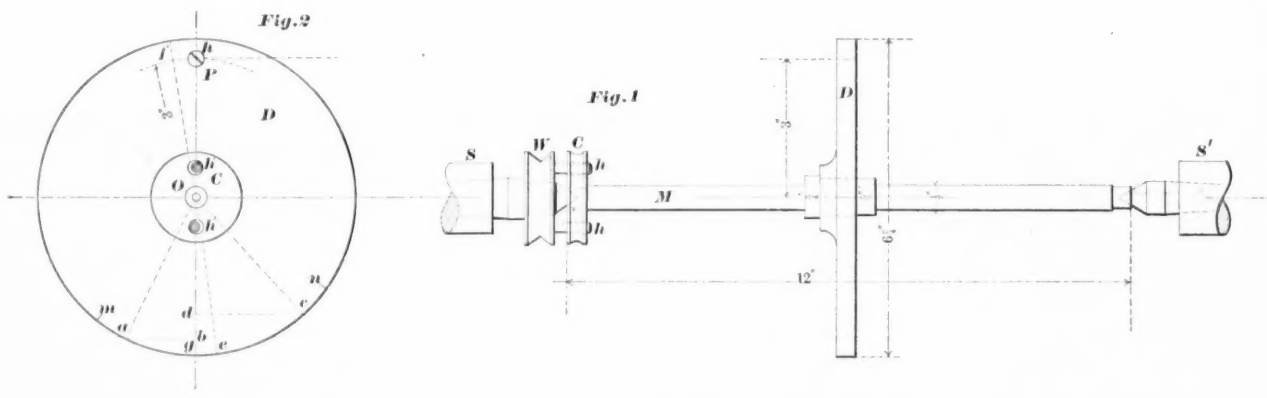
Having a life-long habit of accepting the results of observation and experiment as the basis of all knowledge, by which opinions should be modified, and to which theories must be made to conform, I so accepted—not without reflection, but without experiment, and with too slight examination—the statements put forth by the Defiance Machine Works in their little "Treatise on the Art of Balancing the Rotating Parts of Machinery" [Toledo, O., Edition of 1881], as most concisely stated in *Maxim E*, p. 32, as follows: "If there be within all parts of a circle described by the center of gyration of an unbalanced, rotating body, a sufficient amount of matter to resist by reaction the centrifugal tendency of an excessively heavy portion, such heavy portion will strive to recede from the mechanical center so long as the impelling force, applied at the mechanical center, continues, and is opposed by inertia; but when the inertia is overcome, the heavy portion will approach the mechanical center."

The meaning of the above language is plain, although the language itself is not free from ambiguity: but the basis of authority on which it reposes is to be found in the leading paragraph on p. 31, under the heading, "Maxims," which is as follows: "In the course of extended and costly experiments, conclusions were reached which seem sufficiently stable to be regarded as laws. For convenience of reference, and for conciseness, we arrange them as such."

Accepting, in good faith, these surprising results of "extended and costly experiments," I sought for some menstruum which should render them soluble, so that they

would mingle with such knowledge as I already possessed on the subject, and found one, in appearance at least, in the analogy of the gyroscope. As this fascinating instrument, when made to revolve at a certain speed, sustains its unsupported weight against gravity, to which it yields when the speed is reduced too low, so, I thought, an unbalanced rotating body *may* (as these experiments are said to prove it *does*) revolve quietly at a velocity sufficiently high, although shaking violently at an inadequate speed; and the familiar example of an unbalanced emery-wheel, which shakes a whole building when first set in motion, but "sleeps" as quietly as if perfectly balanced, when it has attained its full speed, also presented itself to my mind. I therefore accepted the statements of the "Treatise," provisionally, but intended to make an apparatus illustrating them at some convenient time.

During the interesting and very courteous discussion in your columns—discussion excited by my incidental and quite uncalled-for remark on the subject in my article on "Balancing the Running Parts of Steam Engines," in your issue of Nov. 29, p. 4,—I have made many experiments with the apparatus shown in Figures 1 and 2. *M* is a mandrel, or arbor, of steel, $\frac{1}{2}$ in. in dia., 12 in. long, with a boss near the middle of its length, $\frac{5}{8}$ in. dia., for the seat of the disk, *D*, with a collar $\frac{3}{4}$ in. dia., against which the disk is seated. The disk, *D*, is of brass, $\frac{3}{8}$ in. thick, $6\frac{3}{4}$ in. dia., with a short hub on one side, making the length of the hole where seated on the mandrel, about $\frac{3}{4}$ in. The mandrel is quite true and straight, and has good centers, and is hardened at the ends. On one end is fastened a small brass disk, or coupling, *C*, $\frac{3}{8}$ in. thick, 2 in. dia., having two holes, shown at *h'*, *h'*, in Fig. 2, a little larger than the horns, *h*, *h*, Fig. 1, which are therefore quite free in the holes, but equally distant from the center of the mandrel. A whirl, *W*, has the two horns, *h*, *h*, fastened in the position shown, to drive the mandrel and disk by the coupling, *C*. This whirl is loose on a cylindrical seat prepared for it on the live-spindle center of an engine lathe, which, during these experiments, is thus a dead-center lathe. The whirl, *W*, is 1.66 in. dia., in the bottom of the groove, and is driven by a round leather belt, $\frac{5}{16}$ in. dia., from a pulley $13\frac{1}{2}$ in. dia. over head, on a counter with fast-and-loose pulleys 6 in. dia., driven from a $13\frac{7}{8}$ in. pulley on the line shaft. The normal speed of this shaft is 200 revolutions per minute, and that was found to be about its speed, by several countings.



The speed of the disk was, therefore, about

$$\frac{200\times13.875\times13.5}{6\times1.66} = 3{,}760 \text{ rev. per m.}$$

A brass screw-plug, *P*, slightly tapered, with slot, for screw-driver, is screwed securely into a hole tapped for it in the disk, at 3 in. from the center, and finished off flush on both sides of the disk.

An attempt was then made to balance the disk, with the plug in its place. A good deal of drilling was necessary for this, mostly on the side opposite the plug; and after all our pains, it was still a little out of balance, as will appear later. A very light mark made with a sharp-pointed tool, at full speed, was sensibly—but very little—deeper, and more conspicuous on one side than directly opposite. The edge of the disk was highly polished to render marks conspicuous.

The screw-plug *P*, was then taken out, and the disk was set in motion, resulting in a vibration very sensible to sight, touch and hearing. The outlines of disk and mandrel were blurred, a distinct tremor was felt, and a clear, low note was distinctly audible even to me. On cautiously moving the tool towards the edge of the disk, turning the feeding-screw, step by step, about 5 degrees at a time, suddenly, while I could distinctly see through a space left between the point of the tool and the surface of the disk, a spiteful shower of chips against my eye-glasses told me that I had marked the protuberant side. Examination showed that a mark extending about 90 degrees, from *m* to *n*, Fig. 2, extremely fine at the beginning and end, and deepest at the middle of its length (at *e*) proved that the heavy side of the disk was most protuberant when in revolution. I again tried, with greater care, turning the feed-screw only about 3 degrees at a step, to make a lighter, shorter mark, and succeeded in a measure, the mark now extending only about 68 degrees, from *a* to *c*, with its center again at *e*, as before. The center of gravity was not, then, exactly opposite the hole from which the screw-plug *P*, was removed,—not in the line *o g*,—but in the line *o e*, nearly 9 degrees from *o g*.

We therefore know that the disk was not in perfect balance when the screw-plug was in place.

The screw-plug weighs 66 grains, and $\frac{66}{7000} = .00943$, which is its weight in lb. avoirdupois. Its centrifugal force, when revolving 3,760 times per minute, at 0.25 ft., radius, was

$$F = 3{,}760^2 \times .00943 \times .25 \times .0003409^* = 11.362$$

that is, less than 0.01 lb. exerted a force of 11.362 lbs. to spring the mandrel, equal to 1,205 times the force of gravity acting on the same mass.

The deflection of the mandrel, computed by D. K. Clarke's formula,

$$D = \frac{Wl^3}{38000\, d^4}, \text{ in which } W = \frac{11.362}{2240}$$

$l = 12$, $l^3 = 1728$, $d = 0\ 5$, $d^4 = .0625$;—is

$$\frac{11.362\times1728}{2240.\times38000.\times.0625} = 0.0037,$$

a little less than 0.004 in. The throw was certainly more, as the deepest cut, the mark extending around 90 degrees of the circumference, is about 0.01 in. deep; but a part of the throw is probably due to a little looseness on the centers, necessary in order to admit oil. In one experiment, the centers being a little too tight, one center stuck fast, and twisted off, letting the mandrel and disk fly out.

The experiment here described with much detail, was the last of several, all of substantially the same character, only that some precautions, learned by experience, were taken in this final experiment, to secure accuracy. The pitch of the note produced was about what was to be expected: 3,760 revolutions per minute, being equal to $62\frac{2}{3}$ double vibrations per second, corresponding very nearly to *C*, two octaves below middle *C*, $\left(\frac{256}{2\times2} = 64\right)$, and two octaves above the lowest audible note $\left(\frac{64}{2\times2} = 16\right)$. I had no means of judging of the pitch of the note but by the ear, but have no doubt that it was about as above stated. I am aware that the speed I used was not very high—not high enough, perhaps (in the language of "*Maxim E*"), to "overcome the inertia,"

* $\left(\frac{2\pi}{60}\right)^2 \div g = .0003409.$

but it was about as high as I liked to employ with an unbalanced disk running on centers. As it was, it gave to the mass of the screw-plug, weighing 0.15 oz., at 0.25 ft. radius, a force of 181 oz., equal to more than 1,200 times the force of gravity; and certainly, up to this speed, the throw of the unbalanced disk was constantly towards its heavier side.

Machine Shop Wages in Europe.

In 1879 the Department of State published an interesting volume on the "State of Labor in Europe," being a compilation of Consular reports on wages, cost of hiring, and other particulars from the principal European countries. It attracted wide attention at the time. In our issue of Sept. 20, 1879, we copied the figures, given in that volume as the wages of machine shop men in several countries. The State Department has now published another volume of U. S. Consular reports entitled "Labor in Europe," which is decidedly interesting. In the former reports the rates of wages given were those of 1878, in the latter those of 1884. We have made a number of abstracts of rates of wages as given in the new volume, which are published below. In some cases we give the rates prevailing in the same place in 1878:

Newcastle-on-Tyne, England (per week of 54 hours for men in a railroad shop): foremen, $11; erectors, $8.66; fitters, $7.33; boilersmiths, $8.30; blacksmiths, $7.13; turners and machine men, $6.39; brass finishers, $8 12; pattern makers, $7.39; laborers, $4.69; stationary engine drivers, $5.45. In 1878 (per week of 54 hours) turners and machine men, $5.04 to $8.16; boilersmiths, $5.52 to $8.64; fitters, $5.04 to $7.68; foreman of shop, $10.08 to $18 00; blacksmiths, $6.72 to $8.16; brass finishers, $7.44 to $7.92; engineers, $7.92 to $10.80.

Dundee, Scotland (per week of 54 hours): fitters and finishers, $7.14; pattern makers, $7.41; iron moulders, $8.34; blacksmiths, $7.29; turners, $7.29; planers, $6.38; slotters, $5.18; drillers, $5.54; boiler riveters and caulkers, $8.01; assistants, $4.71. In 1878, (per week of 54 hours), fitters and finishers, $6.00 to $6.50; moulders, $7.00 to $7.50; boiler makers, $6.75 to $7.25; blacksmiths, $6 50 to $7.00; pattern makers, $7.00 to $8.00.

Iron shipbuilders' wages in Scotland, (District of Dundee) (54 hours a week): blacksmiths, $6.55 to $8.01; blacksmith's hammerer, $4 62 to $4 86; platers and fitters, $7.41 to $28.54, with an average of $17.98; riveters, $7.04 to $18.12, with $12.63 average; heaters, $2.18 to $4.12; hole borers, $5 00 to $8 00, with $6.44, average; caulkers, $7.04 to $12.15.

Bremen, Germany. Average wages per week of 60 hours: Master foremen, $8 33; engineers, $4.28; moulders, $4.28; foremen boiler makers, $6.66; blacksmiths, $4.28; apprentices, $1.75; machine shop laborers, $3.33.

Leeds, England, (per week of 54 hours): model makers and blacksmiths, $7.40; fitters, $6.96; turners, $5.94; moulders, $7.56; foundry engine men, $5.04; coremakers, $6.96; apprentices, $2.10; laborers, $4.40. In 1878 (per week of 54 hours), machinists, $6.72 to $7.68; pattern makers, $8.16; blacksmiths, $7.20 to $7.68; engineers, $7.20 to $7.68.

Mr. Dockery, Consul at Leeds, gives a general idea of the way iron workers live in that large manufacturing city:

"An iron refiner, forty-nine years old, has a wife and four children, the eldest a boy of eighteen, the youngest a girl of eight; earns $8 per week; his eldest son earns $1.68, and his eldest daughter $1.02 per week, making a total earning of $10.70 per week; the boy is an apprentice at the file trade, and the girl runs a machine in a clothing house. Food—Breakfast, bread and coffee or tea; dinner, potatoes and meat or bacon; supper, same as breakfast. Occasionally the children go without supper. Only manages 'to keep body and soul together.'"

Barmen, Germany, (average wages per week of 63 hours): machinists, $5.00; turners, $4.28; planers, $3 81; drillers, $3.45; model makers, $5.00; foremen, $7.14; machine laborers, $3.45. In 1878: machinists, per day, 51 cts. to 71 cts.; iron moulders and boiler makers, $4.64 a week; laborers, 47 cts. a day.

Strasburg, Germany, (per week of 60 hours): machinists, $5.85; moulders, $5.10; turners, $5; planers, $4.20.

Berlin, Germany, (per week of 60 to 78 hours): machinists, $4.45; blacksmiths, $4.76; moulders, $4.53; laborers, $3.42.

Cork, Ireland, (56 hours a week): machinists, $7.79; fitters, $8.03; moulders, $7.79; foreman moulder, $12.16. In 1878, machinists, $1.09 a day.

Department of Gironde, France, (per week of 60 hours): machinists, $7.43; moulders, $5.11; pattern makers, $6.41; boiler makers, $5.40; blacksmiths, $5.66; tool makers, $6.41; machine shop foremen, $16.21.

Marseilles, France (60 hours): fitters, $5.07; boiler makers, $4.63; blacksmiths, $4.85; carpenters, $5.60.

Brussels, Belgium, (per week of 60 hours): machinists, $5.79; blacksmiths, $5.79; turners, $5.79; boiler makers, $4.82; moulders, $4,63; model makers, $5.79. In 1878, machinist, $22 to $38 a month; blacksmiths, 48 cts. to 96 cts. a day; model makers, 60 cts. to $1 a day.

Amsterdam, Holland, (per week of 66 hours): turners, $4.80; pattern makers, $4.92; finishing shop, $4.56; foundry, $4.68; blacksmith shop. $5.50; boiler maker shop, $5.45; laborers in yard, $3.60.

Switzerland (per week): turners, $5.15; smiths, $5.12; boiler smiths, $5.25; founders, $5.56; core makers, $4.46; brass founders, $6.56; cast iron cleaners, $3.47.

Austria (average weekly wages for all consular districts): blacksmiths, $3.18; brass founders, $3.60; cutters, $3.00; millwrights, $3.10.

In regard to cost of living in Austria as compared with the United States, Consul General Weaver writes: "The difference in the cost of the necessaries of life—food, for example—in Austria, when compared with that in the United States, is not very great, but when the mode of living is taken into account the difference becomes very striking. Flour, meat and vegetables generally cost more in Austria than in the United States, particularly the flour and meat, as these articles can almost be imported from the United States to this country with profit. House rent is approximately as high as in the United States; but in the article of clothing the difference is largely in favor of this country, being about the only article of prime necessity to the laboring man which can be purchased at less cost in Austria than in the United States. But when we come to consider the mode of life practiced here by the laboring man, the contrast is very great. Food and clothing are limited to a minimum, both in quantity and quality, the former consisting generally of rye bread with figs, coffee and soup, or meat

with vegetables not more tha once a day, in many cases only once a week, while the clothing is coarse and durable. Were it otherwise the small pittance earned would not suffice, even with the greatest economy."

Copenhagen, Denmark, (per week of 60 hours): machinists, $4 56; turners, $4.92; blacksmiths, $4.20; boiler smiths, $3.90. In 1878, iron turners, 65 cts. a day; blacksmiths, 65 cts. a day of 12½ hours.

Russia (per week of 68 hours for piece workers) metal turners, $5.47; metal planers, $5.76; blacksmiths, $5.33; moulders, $4.62.

Thuringia, Germany, foundry and machine shops, (per week of 66 hours), the wages earned run from $2.20 for laborers up to $3.40 and $3.75, the highest to casters and engineers.

"In his great establishment at Essen, Germany, Mr. Krupp, who employs in his machine shops and manufacturing departments about 10,000 men, reports that the average wages paid per day to his mechanics was 81 cents in 1878, and 84 cents in 1884."

According to the *Fort Worth Gazette* some Texas officers have developed great capacity for money makiug; on small salaries and with large families they have been enabled to make enough to buy large tracts of land.

Boiler explosions seem to be worse this year then usual. Several very bad ones have occurred this year.

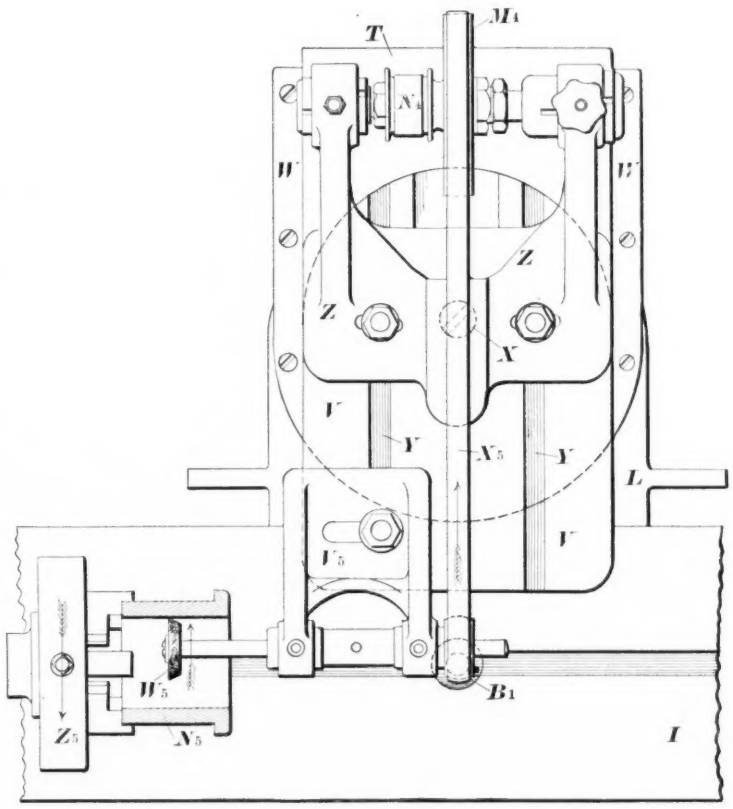


Fig. 12

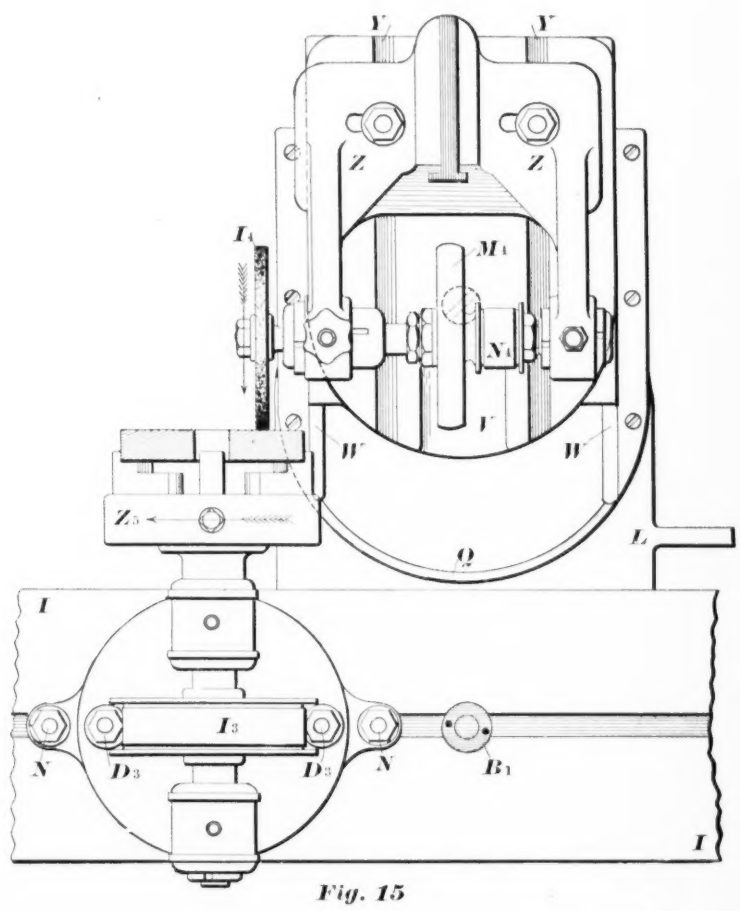


Fig. 15

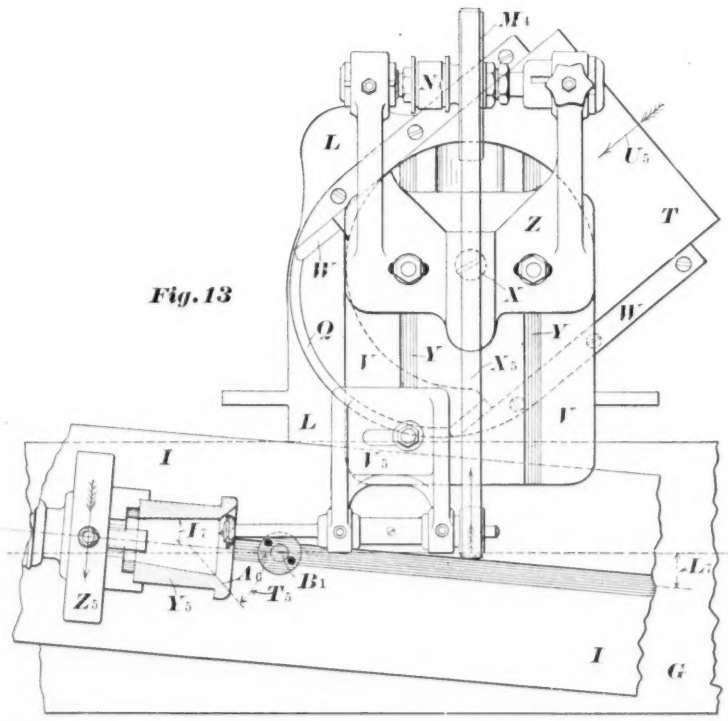


Fig. 13

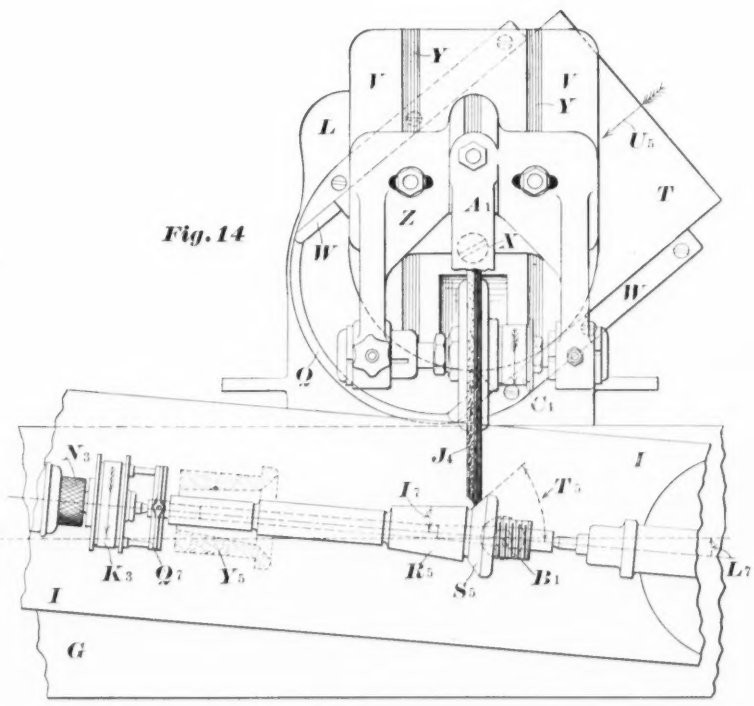


Fig. 14

more conveniently mounted on the special chuck provided for this purpose. The wheel, I_4, is set to the work by the cross feed, and the automatic table feed can be used for feeding. It is evident that the surface ground in this manner may be plain, concave, or convex, depending upon the setting of the head-stock. Thin milling cutters are usually ground concave—thinner at the center than they are at the teeth—to give the cutter clearance in cutting its way through the metal. For grinding work on the face-plate, or chuck, as shown in Figs. 12, 13 and 15, the head-stock can be set at any angle within the whole circle.

Examples of Work Done on the Grinding Machine.

FROM "CONSTRUCTION AND USE OF GRINDING MACHINES," BY THE BROWN & SHARPE MANUFACTURING COMPANY.

The adjustment of the machine for plain internal grinding is shown in Fig. 12, which is a top view of part of the machine. At the forward end of the wheel platen, V, a small wheel-stand, V_5, is bolted over one of the T slots, Y, as shown. The spindle of this wheel-stand is driven by the belt, X_5, connected with the pulley, M_4, which is put in place of the emery wheel on the wheel arbor of the large wheel-stand, Z. The emery wheel, W_5 (Fig. 12), must in this case be run backwards, because the screw which secures it is right-handed. This makes it necessary to cross the belt in this particular case. The work, N_5, held in the chuck, Z_5, is run forwards in the usual way, as indicated by the arrow. The emery wheel is brought against the work by means of the cross feed, while the automatic table feed may be used for feeding longitudinally.

Grinding taper work, such as spindles and boxes of lathes, milling machines, etc., is illustrated in Figs. 13 and 14. The work in Fig. 14 represents a spindle which is to be ground at R_5 and S_5 to fit the box Y_5 in Fig. 13. The usual custom in such a case is to fit the spindle to the box, which makes it necessary, of course, to grind the box first. The box, Y_5 (Fig. 13), is held in the chuck, Z_5, as shown, and the arrangement of the wheel-stands and the belts is the same as explained in the preceding case (Fig. 12), but the swivel table, I, and the wheel bed, Q, must be set to the proper angles to grind the desired tapers. When the taper of the hole is not greater than ten degrees, the machine may be at once set for both tapers, as shown in Fig. 13. For grinding the taper hole of the box, Y_5, the swivel table, I, is set to an angle, L_7, equal to the angle I_7, on the box, or one-half the taper of the hole. The wheel bed, Q, is set to an angle which is equal to the sum of the angles, I_7, and the complement of T_5. For example: If $I_7=5°$ and $T_5=45°$, then the table, I, is set over five degrees, and the wheel bed, Q, is set around to $5+(90-45)=50$ degrees, which will give a movement to the wheel slide, T, in the direction of the arrow, at U_5, at an angle of 45 degrees, with the *axis of the box* as called for by T_5 in this example. After the machine is thus set, the feed may be operated for grinding the taper hole the same as explained in connection with Fig. 12, but in grinding the bevel at A_6 the work must be brought against the wheel with the crank wrench, and the feeding must be done by hand with the cross feed, which will move the wheel in the direction of the arrow, U_5.

After the box, Y_5 (Fig. 13), is ground, the spindle (Fig. 14) may be placed on the centers, preparatory to grinding, without altering the *setting* of the table, I, and the wheel bed, Q. The small wheel stand, V_5 (Fig. 13), is removed from the machine, and the pulley, M_4, on the wheel arbor is replaced by a large emery wheel, and arranged as shown in Fig. 14. The feed in this case is operated the same as explained in connection with Fig. 13. For convenience of trying the box on the spindle, during the process of grinding, it may be placed as shown by the dotted lines at Y_5 (Fig. 14), being supported by something resting on the table, I, so it will not touch the spindle as the latter revolves. By doing this the spindle need not be removed from the centers for the purpose of trying it into the box.

The advantage of grinding both the spindle and the box with *the same setting of the machine* will be readily appreciated, since the angles, I_7 and T_5, as ground on the box, Y_5, in Fig. 13, must necessarily agree exactly with the corresponding angles on the spindle in Fig. 14.

The method of grinding the sides of such work as collars, washers, milling cutters, etc., is shown in Fig. 15. The work is held in the chuck, Z_5, the head-stock spindle being turned at right angles to the table, I—the ninety-degree mark at the base of the head-stock. Thin washers and cutters are

Mr. S. W. Johnson, locomotive superintendent of the Midland Railway, of England, has tried an experiment in locomotive construction that in many cases has resulted in failure, and in which he is not likely to be exceptionally successful. It is well known that to do certain work with a locomotive, cylinders of large size, will use the steam more economically than small cylinders if the steam can be cut off early enough in the stroke. Mr. Johnson in designing some new engines with the Joy motion, assumed that he could distribute the steam so that large cylinders could be used economically. With a boiler providing 1,122 square feet of heating surface, he put on cylinders 19x26 inches. Published reports seem to show that the engines are failures in service for want of steam.

Dickson Manufacturing Works.

For perfect facilities in producing light machine work, ranging from a revolver or sewing machine up to an ordinary lathe, American machine shops beat the world; but when work has to be handled ranging into tons the general run of our shops are away behind. The Dickson Manufacturing Works form an exception in this respect. Handling a great deal of extremely ponderous material, rough and finished, the shops have been provided with facilities for moving heavy weights with no more strain on the establishment than is caused by the handling of a cylinder head. The different shops that constitute the works are admirably arranged, and well provided with the best of tools for producing and moving heavy work; but the machine shop struck us as the most advanced of its kind we had seen for some time. The shop was built from the designs of E. D. Leavitt, jr., of Cambridgeport, Mass., who is consulting engineer for the company. The shop is a high oblong building, the matter of perfect lighting having evidently received supreme attention in the design. The ground floor is the principal part of the machine shop, and a wide part extending from end to end of the building is open to the roof. On each side there is a narrow gallery where small tools are located and where the fitting up of light work is done. The tool room is also in this part. The galleries are supported by wrought iron pillars, and on the tops of these are lighter iron pillars which help to support the roof and carry a track traversed by a traveling crane capable of moving twenty tons to and from any part of the shop. A man is kept handling this crane all the time, and it seems never to be idle, but it makes no call for exclusively heavy burdens, fifty pounds being moved around as readily as a piece weighing five tons.

The principal work done in these shops is on machinery for mining and hoisting purposes. Several large engines are on the floor partly finished. They are horizontal engines with guides, which were cast along with the bed plate and bored out in true alignment. They have slide valves with what is known as the Poore balancing device, an arrangement that makes the valve act partly as a steam chest. Some very heavy hoisting drums are on the floor and apart from their size they are noticeable as fine castings. There are several coal-breaking machines, familiarly spoken of as "coal crackers" in the shop, and some of them look as savage articles as anything inanimate can well be. They consist of cylinders covered by rows of strongly secured steel teeth. Two cylinders are set parallel in a frame, and by means of heavy gearing turn towards each other, and the teeth crunch up the coal that is thrown on to these unmerciful jaws, till it is the proper size for falling through. Besides these machines there are others intended for various coal-working operations, and a heavy set of rolls intended for the boiler shops of these works.

The shop contains some very heavy tools, among them being a boring mill capable of taking in a hoisting driver 16 feet diameter, a lathe with 20 feet swing and a Hewes & Phillips planer 8 feet between uprights. A Sellers boring mill on the floor was highly spoken of for its convenience and adaptability. Beside all the heavy tools small swing cranes are placed having an endless chain hoist for moving work. There are four lines of shafting in the shop, one on each side of the ground floor and one in each gallery. The lines are driven by separate engines—small upright double cylinder engines that are run at a moderately high speed. All these engines exhaust their steam into a reservoir from which pipes are conveyed through the shop for heating. The pressure on the reservoir gauge stood about 3 pounds, which would not represent much back pressure on the engines, yet the shop was warm and comfortable, although the temperature outside stood about zero, with a fierce wind blowing. E. K. Sancton, the assistant superintendent of the works, finds that having the lines of shafting run by separate engines is a very convenient arrangement in cases when overtime has to be worked and only a few machines are needed.

In the boiler shop there is a huge boiler nearly finished that is intended for the Hecla & Calumet mines. It is 90 inches diameter and 34 feet long, made of Otis steel $\frac{9}{16}$" thick. When finished the boiler will weigh 73,000 pounds. The two consolidated safety valves, which are $6\frac{3}{8}$ inches diameter, weigh with their connections 2,400 pounds. The boiler will carry a pressure of 135 pounds. The boiler shop is provided with a hydraulic flanging machine, 2 hydraulic riveting machines operated on the Twedell system and a full set of ordinary boiler shop power tools.

Connected with the company's offices is a cheerful well-lighted reading room, where a large assortment of mechanical and other scientific papers are kept for the use of the workmen connected with the works. The intention of the company is to extend this by adding a library and a school for the instruction of apprentices. From the officers we learned that the young men take greater interest in the reading room than the older hands. Our visit to the shops was made pleasant by the kindness of our occasional correspondent, F. W. Dean. We have also to acknowledge the kindness of Mr. Broadbent, superintendent, and of Mr. Dickson, a member of the firm.

Fig. 1

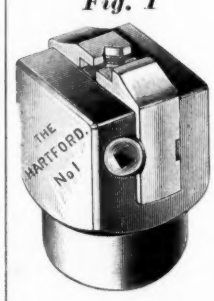


Fig. 2

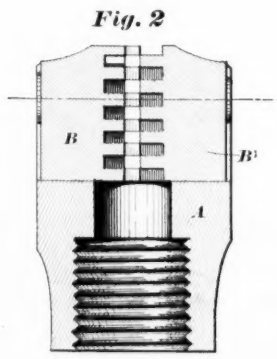


Fig. 3

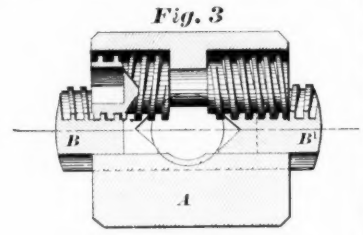
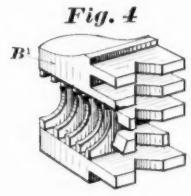


Fig. 4



The New Hartford Drill Chuck.

These chucks are adapted for holding drills, taps, reamers, wood-boring tools, long stock for cutting or working up, and a variety of other purposes. Fig. 1 is a perspective view, Fig. 2 a longitudinal section, Fig. 3 a transverse section, and Fig. 4 represents in perspective one of the jaws. *A* is the body of the chuck, and *B*, *B'* the jaws. The general construction will be readily understood from an inspection of the engravings.

The interlocking teeth, with the V-shaped notches, permit the grasping of any drill, tool or wire, however small, and at the same time center it accurately and hold it firmly, without inclination to spring or bend, or otherwise injure it.

The square form makes it convenient to apply a wrench to remove it from the lathe or other machine upon which it may be used, and also affords a longer bearing for the actuating screw.

The manner in which the jaws are guided, and the actuating screw arranged, tend to preserve truthfulness of the jaws.

A. F. Cushman, Hartford, Conn., is the manufacturer.

Sir Frederick J. Bramwell, in an address before the Institution of Civil Engineers (England) said that in an investigation by the Corporation of Birmingham to determine whether they should approve of a proposal to lay down power-distributing mains in the city, they indicated six non-condensing engines, taken indiscriminately, the engines ranging from five to thirty nominal horse-power, and found that the coal used was in no instance less than 9.6 lbs. per indicated horse-power per hour, and in one instance was 25.5 lbs.; the average was 18.1 lbs. This enormous consumption of fuel he credits to the prevalent practice of using large cylinders for a small amount of work.

Speaking of gas engines he said they were now made of 50 horse-power, and when using gas made on Dowson's system $1\frac{1}{2}$ lbs. of culm will give one horse-power per hour. One lad, he said, could manage the gas-producing apparatus for 300 horse-power.

Early Engineering Reminiscences.

By George Escol Sellers.

TWELFTH PAPER.

The Charleston & Hamburg Railroad of South Carolina is frequently spoken of as the first long railway commenced in America; it being 150 miles long. I have no memorandum as to the time of its commencement, but I have always understood that it was under the charge of Horatio Allen as chief engineer, and that he was appointed to that position after his return from England, where he went in the fall of 1827 to procure three locomotives for the levels between the inclined planes on the Delaware and Hudson improvements. In his account of the first trial trip of the "Stourbridge Lion," one of the engines he then procured, and for which he drew the throttle valve, he gives the date as August 8, 1829. If it was after that date that he took charge of the South Carolina Railroad, it was after considerable work had been done on the Baltimore & Ohio, and on the Pennsylvania improvements including the Columbia and the Allegheny Mountain, or Portage Railroad division; also on the Hudson and Mohawk Railroad. This goes to show an almost simultaneous commencement of railroads in widely separated sections of our country. But of early engineers none deserve greater credit than Horatio Allen, both as civil and mechanical engineer.

In an address delivered by him at the Chicago Railway Exposition, June 13th, 1883, in his 83d year, being then the oldest living engineer in America, he alluded to the difficulty he had to induce the directors of the Charleston & Hamburg road to adopt locomotive power. As to constructing that road with the limited means, it was there that Mr. Allen's ability and fitness came into full play. He said: "That in those days first and second mortgage bonds were unknown; they had not succeeded in letting one set of stockholders be gobbled up so another could reap the benefit." The stock subscriptions were alone to be relied on as the means to contruct the road, and the engineer must so construct it.

Economy in every branch of the undertaking must be vigorously adhered to. Long levels without drainage—a constant succession of swamps, the cost of draining of which would in many cases exceed the amount of the subscription for constructing the road. All these difficulties had to be met and overcome, and to meet them Mr. Allen devised and adopted a system of piling, the pile driver advancing and cutting off the piles to the proper level to receive the cross timbers and stringers of the roadway. It was the old wooden stringer or rail with scrap iron facing. I first passed over this road in the year 1850 or '51; it was then a regular T-rail in good condition. I, at that time, noticed at some points where the road had been straightened or changed in its course, some sections of the old wooden pile roadway still standing. The inclined plane on the Savannah River at Hamburg had been displaced and a regular graded road substituted. The swamp sections had been drained and crossed by good solid earth embankments, as well as low and undulating lands where the pile system had been adopted as cheaper than grading and had given place to cuts and fills. Mr. Allen's pioneer railroad had grown to a first-class railway, and I was informed it had been done without issuing mortgage bonds or increase of the original stock. General Brisbin of Charleston, at the time of my visit in speaking of Mr. Allen's great achievement, said he had given them a "self creating and a self sustaining railroad." In explanation of this expression he said, the road had from the start exceeded the most sanguine anticipations of its original projectors both in passengers and freight, and a course was adopted of appropriating all net earnings beyond a reasonable interest on its cost as represented by its stock, to betterments both in equipment and roadway. In that way the pile road gave way to solid embankments, the strap rail to T-rail, and in time much aid to the construction of the branch to Columbia the capitol of the State. He thought he had made good his assertion as to "self-creating and self-sustaining."

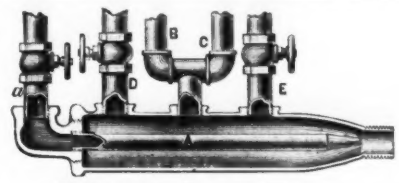
It was rarely that our early engineers had full play and the confidence of the directors, as Mr. Allen had, enabling him to carry out his own plans. Even in the States that were making their own improvements, there was a power above the engineer whose approval must be had for every move, and from whose decision there was no appeal. In Pennsylvania and some other States, this was a board of canal commissioners, too often a place for politicians, but supposed by the legislators who, in their abundant caution had created them, as a safeguard, selected for sterling integrity and business abilities. Pennsylvania had as good a board as fell to the lot of any State. Yet carrying out their plans that did not in every case harmonize with the views of their engineers, was sometimes annoying and difficult. I will cite but a single instance. It was at the time that my friend John C. Trautwine was engaged on his first work as a railroad engineer (having charge of the section of the Columbia Railroad between the bridge on the Schulykill, at Peter's Island and foot of the inclined plane to the Broad Street Station), that a Sunday mineralogical excursion was planned; for even at that early date Trautwine's hobby, outside of his profession, was mineralogy. We were to go to Bristol by steamboat, and there be joined by Dr. E. Swift of Bustleton, and Mr. Vanmixer, the then leading mineralogists of Pennsylvania, and together visit certain limestone quarries in Bucks County. On our return to Bristol, we were met by Mr. Hufnagle, who, as engineer, was in charge of constructing the locks on the Delaware division of the Pennsylvania works. He was in great trouble, having progressed so far with the works as to have completed the foundations, and part of the side walls of chisel-dressed stone—most of which was on the ground and a considerable portion of it dressed—when he received orders from the Canal Commissioners to suspend operation on the stone locks, as they had, on a reconsideration, decided on wooden locks. This was in consequence of the representations of owners of a small class of coal boats from the Lehigh, that the stone walls would tear and injure their boats in their rise and fall in the locks. In vain had Mr. Hufnagle represented that in the size of the locks under construction as compared with the small class of boats, with reasonable care, although the boats were not protected with projecting gun-wales plated with iron as the ordinary canal boat, no injury could possibly be done to them. The orders were imperative; the wooden side walls must be of timber 12 inches thick, supported by rough stone back walls instead of the dressed stone. It was reported to the Commissioners that a large portion of

the gate recesses were far advanced towards completion; to start the wooden side walls at the bottom of the locks, and maintain their width, considerable of the side walls would have to be taken down. The matter was finally compromised by starting the timber sides inside of the dressed stone walls, thus reducing the width of the locks 2 inches, and completing the gate recesses as originally designed. In consequence of the large quantity of stone blocks on hand another concession was made, allowing their faces to be roughly hammer-dressed. At the time I refer to, Mr. Hufnagle was engaged in a series of experiments with the hydraulic cements, with the intention of dropping back with the hammer-dressed walls as soon as the timber lining should reach the height of the chisel-dressed walls as far as they had been finished, so as to leave a space of an inch or more between the timber and the back walls, this space to be filled with hydraulic cement, so that when the time which he foresaw would come for enlarging the locks, by taking out the timber two feet would be gained and smooth wall left. Mr. Trautwine's note-book, which was his constant companion, even during his school-boy days, was out at once, and he eagerly noted all of Mr. Hufnagle's formulas and the results, as far as he had gone with his experiments. It was to this peculiarity of Mr. Trautwine of not allowing anything to escape being fixed in his note-book that the engineers of the present day are indebted for their constant companion, his "Civil Engineer's Pocket-book," with its vast stores of useful information on every subject that can possibly come within the range of their profession.

As to whether Mr. Hufnagle's prediction as to enlarging the locks by taking out the timber came true or not, I have no means of knowing. Sometime afterwards when he was engaged on a railroad in New Jersey, I think it was the Camden & Amboy beyond Bordentown, in a conversation with me he laughingly referred to what he termed his *dodge* to get round the commissioners and maintain the original width of locks, but he added that he did not think there was any use in it, for he had pretty much made up his mind that canals must give way to railroads even for heavy freights.

While Mr. Trautwine was superintending the laying of the first T-rail that ever came to America, and was then called the Stephenson wrought iron rail, in contradistinction to the cast iron fish-belly rail then in use, the same kind of work was going on beyond the head of the inclined plane. The rails were being laid and keyed in cast iron chairs, secured to large square blocks of lime stone, and partly on long stone crossties, the chairs being fastened to the stone by iron bolts, leaded in holes drilled in them. This work and that on the wooden truss bridge across the Schuykill, the inclined plane with the engine house and machinery at the head of the plane, were all sources of great interest and attraction to the Philadelphians and the people of the surrounding country. On one occasion, in company with Mr. Trautwine and his associate Elwood Morris, we crossed the Schuykill and walked to the head of the inclined plane, there we found a large collection of citizens who had come in carriages, on foot, and in skiffs by way of the Schuykill, all greatly interested in work so new to them. Major Wilson, then chief engineer, stood the center of quite a crowd, he seemed to be a good deal annoyed by the questions he was plied with; many of them no doubt of a character to annoy, but the high standing and character of the questioners were such that civil answers must be given. While this was going on my attention was called to a group slowly advancing toward us; among them was my father. He and the others seemed much amused at the quaint actions of a respectable farmer, a broad-brimmed and broad-skirted member of the Society of Friends, who was known to be as level headed a man as was to be found. He would go down on one knee, put his head near the ground and look along the line of the road, then he would straighten up, hold his cane, that had a cross-head handle, between his thumb and finger; making the cane a plumb bob, he would look along its cross-head, evidently making his own observations and commenting on them; which, together with his quick and quaint actions, was the cause of merriment to those with him; when they joined the group around Major Wilson, to whom our Friend was formally introduced, and at once began, "Friend Wilson, I notice that thee has run the road between here and Friend ———'s farm, first to right, then to the left and again to the right and left, much like a long letter S or a dollar mark ($), where the straight lines would be the shortest; what is thy object for doing so?" The Major, either knowing or suspecting his questioner to be a farmer, chose in answering him, a familiar illustration. He said "If you take a potato in your hand in a few minutes you could learn the number of its eyes, and all its lumps and irregularities. Our potato is bigger, but, as engineers, we have to make ourselves as well acquainted with it before we can locate our road, as you would with the potato held in your hand. Then, in locating we have an *axiom*, that we try as close as possible to adhere to. That is, to make our cuts so that they shall furnish the earth for the piles, thus we 'kill the two birds with one stone.' "But," asked our friend, "does thee not take into consideration the additional length of iron, and the stone blocks, and the labor expended on them?" The reply was, "Certainly, but in this case it does not amount to much." "But," said our Friend, "it takes more power to haul a load over what thee calls curves than on a straight line, and I think this ought to enter into the calculation of first cost." He stooped down and picked up a stone, and, holding it towards Major Wilson, continued: "Thee cannot carry this stone twenty steps and back without expending some power. Now, if thee counts the number of times thee carries it back and forth for a single hour, thee would find how much longer it would take thee to add only one step further to each trip. This is what I mean by the constant loss during all time, and then thy curves will give great additional trouble to the mechanic when he comes to construct steam engines to run this road and accommodate themselves to running around the curves." By this time it was evident the Major was more than annoyed; he was excited, for he replied rather petulantly: "My good Friend, I would have you to understand that this railway is not being made for steam power; it is a State road for the benefit of every one, just as any turn-pike road. The State may furnish wagons or cars, or individuals may put their own on the road, and every farmer may attach his own horses and haul his produce to market, and if I have my way no steam engine shall ever run on the road." He turned his back on the Friend and entered into conversation with some one else in a manner to show his determination to end the palaver.

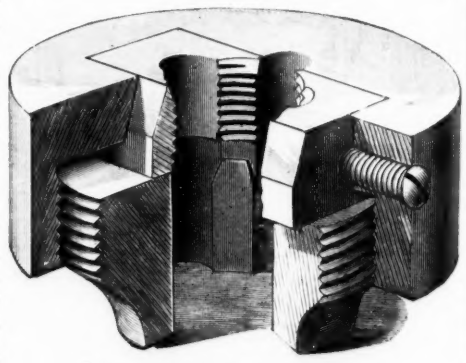
The honest old Quaker flushed as if his feelings were hurt, and stood for a few minutes as if silently communing with the spirit within. Then he spoke in a subdued manner as if he was talking to himself: "Well, for the life of me I don't see the use of the inclined plane to get down to the Schuykill, for by starting at Friend ———'s place it would be easy to strike the river a little above Fairmount dam, or if (naming another farm) by way of Mill Creek Valley through Friend Mayland's place to the river above Gray's Ferry bridge." Major Wilson heard this, and, turning quickly, and in no gentle terms said: "You don't know what you are talking about. It seems to me that you are only talking to hear yourself talk." The reply came very slowly: "*May-be so, may-be so*, but one thing I certainly do know, if I do not know all the knobs and bumps on what thee calls thy big potato—though I was born and have lived all my life among them—I do know that God never created water that could run up hill, and that the water from His living springs and His refreshing rains—all that is not drank up



McDANIEL'S SUCTION FITTING.

by the hungry earth—from the first place I have named finds its way into the Schuylkill above Fairmount dam, and the springs and the rain fall west of that by way of Mill Creek, and this tells me the natural routes to get down as well if not better than thy three-legged *spy-glass* can tell thee. I am an old man and may not live to see it, but there are others present that will, when the inclined plane and all its works will be abandoned and the road will take one or other of the routes that I have indicated. I have walked out the road as now making, and have noticed all its ups and downs and its circumbendibuses, and know that with fewer of them and at less cost, by heading the running water it could have got down. That is all I know;" and he walked away.

In relating the above, I have endeavored to condense the substance of a vast deal of by-play into simple collocution. The impression made at the time was strong, and has been kept alive by frequent reference to it in conversation with Mr. Trautwine, and on more than one occasion we together have seen numbers convulsed with laughter by Ellwood Morris's inimitable mimicking of the old Friend and the Major, frequently with additions and embellishments. I have not told it, although the Friend's predictions came true as soon as the old State Road, which has so aptly been styled the Parent of the Pennsylvania Central, passed into its hands. Nor would I detract from the sterling integrity, perseverance and skill of our early engineers. We are all naturally disposed to follow leads. The great canals of the world made tunneling a necessity; much talent and skill was expended on them. To the tunnels the master spirits of the Liverpool and Manchester added the incline plane; our following was natural, and Pennsylvania was not alone in doing so on her Columbia and her Portage Railroad. The Charleston & Hamburg, the Lawrenceburg & Indianapolis and others might be cited, all of which planes have been superseded by gradual grades, worked by the ordinary locomotive. Major Wilson was filling the wants of the time constructing as he said a "railway turnpike."


LITTLE GIANT ADJUSTABLE DIE.

John J. Grant, of Flushing, N. Y., says he made a pair of roller skates in Rockville, Conn., thirty years ago. He would like to know whether anybody made a pair at an earlier date.

If Colorado is behind in the number of patents granted to her citizens, she is not to be outdone in comprehensiveness. Three patents were recently granted to one of her citizens, all relating to cable tramways, one of which contained 50, another 42 and the third 13 distinct claims; and there was nothing to indicate that the subject was exhausted.

In England when the quantity of gas is poor the gas company is fined. Here the consumer pays a little more for what he uses. That's the difference.

McDaniel's Suction Fitting.

The object of this device is to prevent snapping and cracking in steam pipes used for buildings, dry rooms, etc. By its use snapping and cracking of the pipes in any building that is heated by steam can be done away with. It also increases the heat in dry rooms by keeping the pipes at all times free of water, and thus giving more heat with the same amount of steam; it also maintains an even temperature in the rooms or dryers.

When the water of condensation is returned to the boilers, all the coils being above the boilers it can be used to great advantage, as it increases the circulation, stops noise, and aids the return to the boilers. In such cases it should be used in connection with a jet of live steam, taken direct from the boilers, to work the suction, and a check valve be placed between the fitting and the boiler, but in most cases it is not necessary to use live steam, as by taking the steam from the coils or radiators that get it first from the main steam pipe, the suction is worked by steam that has already been used for heating purposes. It is cheap, easily attached, and may be used wherever steam is applied for heating or drying purposes.

These fittings are being put on the market by Cooke & Co., 22 Cortlandt street, New York.

New Little Giant Adjustable Die.

The manufacturers claim that the die herewith illustrated possesses the desirable features of simplicity, strength and durability.

It will be seen that the cap, or collet, is beveled, also the die. The shank, or guide of collet, is threaded into the cap, and with the bearing surface of guide on the bottom of the die. The die is forced into the bevel of the collet and held as firmly as though it were a part of the cap. These guides are not removed unless new dies are to be put in.

It will be seen that the die is entirely surrounded by the collet, making it essentially a solid die, yet adjustable by simply turning the screws in or out at ends of dies, as the adjustment desired requires.

Manufactured by Wells Brothers & Co., Greenfield, Mass.

LETTERS FROM PRACTICAL MEN.

Steel Shafts.

Editor American Machinist:

Attention is directed to the subject of steel shafts by a reference in your columns to the failure of the steel shaft of the cruiser Dolphin, and a reported decision of the Government engineers requiring the substitution of iron shafts on the other vessels of that class. A few words may be said by one who has used the material extensively for several years, and made many experiments on the metal in a variety of forms. The writer begun the use of steel with a prejudice in its favor—a prejudice which, for many purposes, has been abundantly justified—while for other applications a decision as to its superiority over good iron is still held in abeyance.

Every mechanic must recognize the conceded advantages of steel, its homogeneity, the absence of welds, seams and cinder spots, and the true smooth journals that can always be produced on steel shafts—all of which are merits that cannot be found in the average iron. Steel can now be obtained almost as cheaply as iron, and, when manufacturers and dealers keep full stocks of standard sizes, it will be obtained as readily. But most mechanics have not yet realized the fact that steel is essentially a different metal from wrought iron, and many methods of treatment, commonly practised in the manipulation of iron, must not be applied to steel.

An error of the past has been in the use of too hard steel, or a metal too high in carbon. Now the tendency is to use in construction the very softest steels that can be produced, as the harder and more tenacious metal is much inferior to soft steel in ductility, and

is more liable to fracture under sudden strains.

Steel of any grade should be either thoroughly annealed or so treated in the forging process that the finished bar will be as free as possible from all internal local strains. This is a matter of much importance, the neglect of which may result in serious consequences afterwards. Steel axles, which have been allowed to cool unequally by being laid on a cold or damp floor in the heated condition, have been found unable to endure the drop test.

For the same reason, shafts, which have left the lathe true and straight, will be frequently found sprung or bent after light service without any apparent cause. I know of several steel engine shafts, varying from four to seven inches in diameter, which have developed such weakness shortly after being put in motion, and of a line of shafting in a machine shop, which exhibited similar behavior. For similar reasons, steel boiler plates, which flange better and bear more torture without immediate fracture than the best iron plate, have been found subsequently with unaccountable cracks across their surface. Cold straightening must be avoided as much as possible on steel; bad as it may be for iron, it has been found much worse for steel. Avoid sharp corners, make the rule of large fillets more imperative than for iron. It is probable the standard screw thread may have to be modified to suit steel. A steel axle, which, in its natural condition, will bear much more punishment under the drop than its mate of iron, will be found to break much more readily if both shafts are grooved with a sharp tool, even though the groove be so shallow as to be scarcely measurable.

Finally, when proportioning a steel shaft, maintain the same dimensions as experience dictates to be best for iron. Make the steel shaft neither smaller in diameter nor longer in distance between its bearings. Remember that, though the tenacity and ultimate torsional strength of the steel is greatest, yet the transverse elasticity of both metals is practically uniform, or that a steel shaft will deflect the same distance under a given load as an iron shaft of the same dimensions, although the steel will deflect farther than the iron before taking a permanent bend. This has been abundantly proved by experiment.

The efficiency of a shaft is usually determined by its transverse stiffness; rarely, if ever, can we proportion it to resist torsional stress alone. Heretofore, we have expected too much of steel—more than we have realized by experience. It is still undetermined whether steel possesses any superiority over iron in resisting the extraordinary strains to which the shafts of ocean steamers are subjected.

This valuable metal possesses so many good qualities that its use will be greatly extended when we know exactly what results to expect from it, and how to treat the metal in the workshop to insure obtaining those results. J. C.

Pencoyd, Pa.

"Reworking Steel."

Editor American Machinist:

Under the above heading are to be found in a scientific paper some strong statements of well known facts as to the decrease of tensile or torsional strength of steel resulting from annealing. No mechanic who has observed even in the most casual manner the difference between steel from the rolls or hammer, and that which has been annealed needs to be told, that "the unannealed steel through a large number of tests of the steel made by five of the most prominent and best known manufacturers proved to be stronger than the annealed steel." It is practically the simple question of hardness, stiffness, against softness, malleability, or ductility. It is one of the reasonable, self-evident facts that everybody knows who has had occasion to know anything about the subject. In the same article, however, there are other questions raised which have two sides. That "steel is better as it comes from the hammer than after being worked, annealed, and turned," depends upon whether the hammer had left the steel in its best possible condition, or whether, perchance, further judicious working might not prove a great benefit, which is undoubtedly the case with many bars of steel of very popular brands, even while the question of annealing would depend upon whether the steel was soft enough to be worked advantageously without, and further, upon whether its condition in the bar as it came from hammer or rolls could not be actually improved by annealing, which is many times the case. That "a better tap has been made from a square bar of steel centered and cut to the thread than *could* be made from the same bar annealed and turned" is not very probable. That of two taps thus made from the same bar the one not annealed proved to be the best settles nothing, unless it is known that the annealing was properly done, and that in hardening the operation was performed as well in one case as in the other. Whoever puts too much dependence on the "skin" of the steel as being the best part of the bar will "get left," for there are too many cases in which this "skin" is practically not steel at all, owing to the oxidizing or decarbonizing influence of the furnace in which the steel has been heated in the process of manufacture. It is best to take the "skin" off anyhow, and some statements about steel, even from very trustworthy sources, need to have the surface removed.

S. W. GOODYEAR.

Waterbury, Conn.

The Eufaula Explosion.

Editor American Machinist:

Robert E. Masters, in the AMERICAN MACHINIST of February 28, asks for an expression of my opinion on this disaster. I have only meager data upon which to form an opinion, the principal part of which is Mr. Masters' letters and Mr. Odell's remarks on the same subject. From the tone of Mr. Masters' letters, I imagine he is surprised or indignant at the disaster having occurred, and am at a loss to imagine whether he blames the boiler builder, the contractor (Mr. Steers), or the party in charge of boiler for the disaster; but, outside of the explosion having occurred with such disastrous results, he gives no particulars as to the cause—whether from low water, excessive pressure, ignorance in handling, or criminal neglect on the part of the builder.

The boilers were $\frac{25}{100}$, or $\frac{1}{4}''$ thickness of shell, with a tensile strength of 55,000 lbs. to the square inch, the diameter being 50 inches. Taking the rule usually employed, we have tensile strength 55,000 lbs., multiplied by two thicknesses of shell, divided by diameter, subdivided by a factor of safety 8, with the following results:

$$\frac{\frac{1}{2}\times 55{,}000}{50}=550$$

which, divided by 8, gives 68.75 lbs. safe working pressure.

The rule or law adopted by the Board of Supervising Inspectors of Steam Vessels differs essentially from this, their factor of safety being, I think, 6 instead of 8. I give the rule in full:

"Multiply one-sixth ($\frac{1}{6}$) of the lowest tensile strength found stamped on any plate in the cylindrical shell by the thickness—expressed in inches or parts of an inch—of the thinnest plate in the same cylindrical shell, and divide by the radius or half diameter—also expressed in inches—and the sum will be the pressure allowable per square inch of surface for single riveting, to which add 20 per cent. for double riveting," etc.

This rule, reduced to figures, gives us the following: $55{,}000\div 6=9166.6$; then $9166.6\times\frac{1}{4}=2291.6$, and $2291.6\div 25=91.66$ lbs. allowable pressure for single riveting. To this we add 20 per centum for double riveting, and we have, in case the work was done under supervision of U. S. inspectors, a maximum of one hundred and ten (110) lbs. steam pressure. The U. S. inspection laws provide that "the proportion of hydrostatic to working pressure must be as 150 is to 100;" hence the highest pressure for testing, according to marine inspection laws, would be one hundred and sixty-five (165) lbs. I fail to see where Mr. Masters obtains authority for the statement that "the Government would test them for several years to upwards of 240 lbs."

In addition to the law already quoted, the supervising inspectors also ordain that, "to ascertain the ductility and other lawful qualities, iron of 45,000 lbs. and under shall show a contraction of area of 15 per cent., and each additional 1,000 lbs. tensile strength shall show 1 per cent. additional contraction of area, up to and including 55,000 lbs. tensile strength." It would be well to know if any or all of these conditions were required or complied with in the original boilers, or if the contraction of area came up to these requirements in the case of material which stood a tensile strain of 76,000 lbs.

Taking the tensile strength at the last figure, and applying the same rules as before, we have, according to common practice, an allowable pressure of 95 lbs. for single riveting, and, according to the U. S. inspection laws, a pressure of 126.6 lbs. for single riveting, or a maximum working pressure of 152 lbs. for double-riveted boilers where the tensile strength was 76,000 lbs. Add to this 50 per cent. for hydrostatic pressure, and we have only 228 lbs., at which the boilers should have been tested; this does not require the 280 lbs. named by Mr. Masters.

I agree with Mr. Odell in his views on this subject, wherein he says "it is so much easier to comply with the demands (for high-pressure test) than it is to argue the case," and it may have been for this cause the builders of the new boilers subjected his work to the 300-lb. test.

Mr. Masters' views in regard to boiler construction corroborate those set forth by me in previous papers, and I am glad to see them coming from him, as they cannot be too fully impressed on the minds of steam users. Yet, while I agree with him in these matters, I think boilers can be injured by excessive testing, and it is not the shoddy builder alone who dreads excessive testing, but the conscientious man, who dislikes to see his product injured by injudicious, unnecessary pressure.

There is an allusion made by Mr. Masters to a suit for damages. There is nothing thus far shown in his letters to criminate in any way the builders of the boilers; there is nothing said as to the quality of material and workmanship or insufficient bracing. The only question, as I understand it, is the guarantee given by Mr. Steers "against all damage for one year." At this distance, with the data possessed, it is impossible to say whether the explosion occurred from accident, carelessness, ignorance, criminal neglect on the part of the builder, or various other causes, but common law holds every man innocent until proven guilty, and no blame should attach to the builder until all the facts in the case are fully set forth. Without interest or prejudice in the matter, I would like to learn if a specimen engineer, similar to that described by your correspondent, "Tar Heel," had anything to do with the boilers at the time of the explosion; if so, the solution of the mystery may be easy. On the other hand, if the boilers were improperly constructed or imperfectly braced, let justice be done. GEORGE MARSHALL.

Still Another Plan for Cleaning the Flues of Upright Boilers.

Editor American Machinist:

Reading "Engineer's" letter on cleaning the flues of upright boilers (in your issue of February 28) reminds me of a quicker method, even, than the one mentioned by him. I will not say a safer method, however, but no evil resulted at the time. A small upright boiler connected with a hoisting engine at one of the mines in Colorado got into the habit of getting badly clogged up in the flues. Upon one of these occurrences the superintendent of the mine suggested *his* remedy, and immediately acted upon his suggestion by wrapping up some blasting powder in a piece of thick brown paper, putting the package into the furnace and shutting the door. Talk about flue cleaners; they were not wanted about that boiler. If a little powder wasn't enough, put in more. That solved the whole problem.

E. F. WILLIAMS.

Hard-Running Line Shafts.

Editor American Machinist:

It is my opinion that many of the machine users throughout the country would find it a profitable investment to devote more attention to their line shafts. Many of them will point with pride to their well-kept and smooth-running engine, and tell of its great economy, etc., when right overhead is a line of shafting which often requires 50 per cent. more power than is necessary to run it were it in proper condition. Those who have been obliged to turn such shafts by hand for the purpose of more readily getting at a bolt or set screw, as they pushed up on one side of the pulley, and the old ladder bent and creaked under them while their helper hung his weight on the opposite side until it moved, will probably say my estimate is too small. But I am confident that the saving which can be made by thoroughly overhauling such a shaft will make itself very manifest in the coal account in a short space of time.

If the foregoing shall cause one proprietor or superintendent to take the ladder aforesaid and investigate for himself, I shall not have written in vain.

FRANK H. TREACY.

Poughkeepsie, N. Y.

Drill Sockets—Drills.

Editor American Machinist:

It is not always a pleasing task to criticise an established order of things, but the annoyance from the use of taper drill sockets, as we buy them in the market, has become so great, from long continuance, that I am forced to speak out.

The trouble is, that there is not enough thickness of metal to prevent expansion of the socket, and in a short time the shank of the drill will rattle all around in the hole.

I can see no reason why there should not be metal enough to insure no permanent expansion.

A few years ago a friend of mine ordered of a manufacturer a set of sockets "not to be turned," so that they might have a little more strength; and the bill came, "Special sockets," and at a specially large price. He makes his own sockets now.

While grumbling, I may as well inquire about straight shank drills.

Would it not be just as easy to mark the size of the drill in a place where the chuck would not obliterate the figures the first time it was used? F. J. MASTEN.

A Steam-Engine Difficulty.

Editor American Machinist:

Some time ago I noticed in a mechanical paper, the name of which has escaped my memory, an inquiry as to the cause of the filling up of an exhaust pipe with some mysterious deposit. The inquirer was at a loss to account for it. However, the editor answered, with seeming confidence, that the deposit could not have come in the steam from the boiler, and it must therefore have by some means gotten in through the outboard end of the exhaust pipe.

I hope the questioner was not satisfied with such an answer, and that he has found the real cause of the trouble.

For the benefit of the readers of the AMERICAN MACHINIST, I will give the particular case that came under my notice a few months ago.

A customer complained that his new engine was not doing as well as it did when first started, and an examination revealed (to me) a very unusual state of affairs.

The exhaust pipe, which was horizontal, was half filled, for twenty feet, with a dirty, waxy substance, somewhat like clay, and soapy to the touch. The heater was full, except a narrow passage kept open by the velocity of the contracted exhaust. The exhaust passages and inside of the cylinder were also more or less stuck up with the stuff. In the ends of the cylinder it had accumulated until the piston struck it at each end of the stroke.

The steam pipe was clean. The boiler, though it had been used a year and never opened before, was quite clean. Spring

water was used. The only thing I could lay the trouble to was fraudulent cylinder oil; but when I found there was ten times as much mud, by measure, as of oil used, that solution became unsatisfactory, and I sought advice of a man of science.

This man probably never opened a throttle nor screwed up a stuffing-box, but his answer made me realize once more, as I had many times before, that a knowledge of other things besides iron and mechanics is a good thing for engineers, especially a knowledge of chemistry.

He said there were some substances in water that are not precipitated by boiling, and some that would even rise as the steam does, and that in this case the water probably contained some alkali, as soda, potash or ammonia, and the appearance of the deposit, in the cylinder first, would indicate its presence in the steam, because, on being mingled at that point with the cylinder oil, it produced a sort of soap.

The ease with which the stuff could be removed in washing seemed to corroborate his theory of its being soap.

The action upon the valve seat was to soften and cut away the iron, which caused more waste than the accumulation of soap.

The engine was put in order again, but the trouble soon reappeared, and the owner now intends to get water from some other source, when, I expect, it will cease.

If he succeeds, I will report the result, as it is quite likely that there are many cases of this kind, wasting money for owners, making trouble for the engineers, and perhaps bringing back-action blessings on the unfortunate engine-builder.

F. B. RICE.

Dunkirk, N. Y.

Metal for Locomotive Bearings.

Another circular of inquiry has recently been received from an investigating committee of the American Railway Master Mechanics' Association. James M. Boon, New York, West Shore & Buffalo; J. S. Graham, Lake Shore & Michigan Southern, and J. P. Hovey, Rochester, N. Y., constitute a Committee on "The Best Metals for Locomotive Bearings." Mr. Boon, who is Chairman of the Committee, requests master mechanics to furnish information on the subject, and to guide them, he propounds six questions: 1st. What has been your experience with metals used on engine and tender journal bearings; also on connecting rods and other parts of the locomotive? 2d. Have you used journal bearings lined with lead or other soft metal? If so, with what results? Please give composition of metal other than lead; also sketch showing shape and dimensions of bearing, number of square inches of bearing surface, weight carried on journal, and kind of lubricant used. Give weight of bearing when first put in, and loss of weight to each 1,000 miles run; also length and diameter of journal and loss in diameter from wear. 3d. Have you any knowledge of any composition that answers the same purpose as babbitt metal in connecting rods, etc., that requires a higher degree of heat to melt from friction than babbitt? If so, give composition. 4th. What kind of metal, in your experience, has given the best results for driving shaft, engine truck and tender journal bearings? If an alloy, please give composition, dimension and shape of same; also method of fitting bearings in the cast-iron box or shell. 5th. Have you found the inserting of babbitt metal in journals an advantage? If so, to what extent. Please explain method of inserting. 6th. What metal have you found to give the best results for connecting and parallel rod bearings? What advantage, if any, is there in a solid bushing instead of the square bearing fitted in straps? Is babbitt a benefit or otherwise in connecting rods, and how should it be inserted?

In answering the above please do not confine yourself to the questions, but give any information that may be of interest or throw light on the subject. Send sketches or blue prints of bearings and boxes found to have given good results, and the weight carried on them.

In the course of a private letter recently received in this office from Mr. G. W. Cushing, superintendent of motive power Northern Pacific Railroad, he says speaking of the severe winter and its effect on Northwestern railroads: "The truth is the Northern Pacific road to date has had no snow blockade, and only an occasional delay by snow and wind to its regular trains. While we have less than usual demand for snow machinery, we are far better prepared than ever before to meet trouble. In former years I was ever ready to head a snow party, but now I am quite content to supply the machinery and advise others how to do the fighting.

The Daily Press on the Protectionist Majority in Next Congress.

The letters from 91 of the 138 new members elected to next Congress, giving tariff views, which we published in our issue of February 21, together with a summary of the position of the House on protection, have been commented upon by the daily press in all parts of the country. We placed an advance copy of that issue in the hands of the general manager of the United Press, and through that association the public were made acquainted with the significance of those letters, in a comprehensive telegraph dispatch to the daily papers, before our issue for that week was published. The New York *Sun* gave a condensed summary of *each* of the letters, with the conclusions we derived from them. A large number of dailies containing editorial comments have come to our notice, but probably a much greater number have, for obvious reasons, not been seen by us. With the exception of a few rabid anti-protection newspapers, none have questioned the existence of the protection majority we were enabled to show. Those few journals base their quibbles upon the fact that the members-elect who declare their adherence to protection have not said exactly what per cent. of tariff they favor, or that some of the re-elected members who voted to squelch the Morrison bill might be opposed to protection, or that members might change their minds after going into a party caucus. We have received several more letters from new members, which will be published in a future issue, and *a larger protection majority shown* than was computed in our issue of February 21. A few extracts from daily press comments are given below:

A piece of journalistic enterprise.—*New York World.*

We are disappointed at the poor showing our friends the free traders make in the next House of Representatives. Considering their loud proclamations during the great struggle of last winter, and the energy they displayed in Chicago, they have turned out very poorly indeed in the election. Apart from the fact of Frank Hurd's defeat in Ohio, when he of all men ought to have been triumphantly returned, there is a sure protectionist majority in the new Houses. Thus the revision of the tariff, which will shortly have to be undertaken, is likely to be made in the interest of protection and not in the interest of free trade. It is plain that a great deal of missionary work will have to be done in this country before it is brought over to free trade doctrines. Perhaps our friends might get on better if they would change their dictatorial and infallible tone for one of philosophy and mild persuasion. That is a wise motto which bids us to speak gently to the erring.—*New York Sun.*

Careful examination of the letters from new members of Congress, which were published by the AMERICAN MACHINIST, shows that there may be reasonable doubt as to the meaning of one or two which were reckoned by that journal as giving evidence of protective opinions. Mr. Davidson, from Alabama, for instance, does not give any idea of his purpose, and is associated with men who have voted unitedly for free trade measures. Mr. Pulitzer, of New York, is reckoned a Protectionist; he will probably vote as Mr. Cleveland wishes, and it is not probable that either of them could yet tell how that is * * * It is to be remembered that the Morrison bill lacked only three votes of a clear majority in the House. But 41 Democrats voted against it, and only 19 of these have been re-elected. Of the new members, 10 Democrats are known to be in sympathy with Mr. Randall There would be great doubt whether the protective system could be maintained, therefore, if it were not for the fact that the Republicans have elected 140 of the members of the next House, instead of only 120 of the present House.—*New York Tribune.*

Our excellent contemporary, the AMERICAN MACHINIST, has been at the pains to address letters of inquiry to new members elected to the Forty-Ninth Congress, and has received ninety-one replies, which lead it to the conclusion that there will be a working protectionist majority in the next House o Representatives. This is set forth by our contemporary as a matter of congratulation. But if it be such, why, may we ask, do some of our other valued protectionist contemporaries whine so lachrimosely over recent political events, and why do they declare that the depression under which trade has long labored, and still continues to labor, is the direct and inevitable fruit of those events? We shall expect, hereafter, to see their complaints withdrawn, and a more intelligent view of economical cause and effect presented to their readers. —*New York Commercial Advertiser.*

The AMERICAN MACHINIST has done the public good service by ascertaining, as far as possible, the tariff views of the members of the next House of Representatives. * * * This is an interesting and valuable showing. It ought to remove whatever apprehensions exist in the public mind of harmful tinkering with the tariff during the continuance of the next Congress.—*Troy Evening Times.*

For a week or more our esteemed contemporaries throughout the country have devoted a large share of attention to the figures furnished by the AMERICAN MACHINIST in regard to the views of members of the next House of Representatives on the tariff question. The AMERICAN MACHINIST has taken pains to ascertain the views of the Congressmen-elect, and it finds that at least 29 of the Democratic members are favorable to the protective system, a number sufficient—if they can be trusted to act with the Republican minority, as the protectionist Democrats did last year—to defeat any free trade measure that may be introduced in the House. * * * The tariff is the dividing question of the future, and the friends of American labor must prepare for the issue.—*Brooklyn Daily Times.*

The solidity of the Republican side of the House in favor of protection is the most valuable fact disclosed by the AMERICAN MACHINIST'S enterprise.—*Albany Evening Journal.*

The letters, which are brief and to the point, make very interesting reading at this time on a subject which excited much attention last year. * * * Thus the prospect is that this vexed question will take a rest in the next Congress; or, if disturbed, it will be simply to make such modifications as may be deemed necessary.—*Albany Press and Knickerbocker.*

The AMERICAN MACHINIST—which, by the way, is a model class journal—deserves credit for its practical efforts to contribute to the pacification of the public mind.—*Altoona Morning Tribune.*

The AMERICAN MACHINIST shows its enterprise by trying to ascertain the tariff views of the 138 Representatives elected to serve in the Forty-ninth Congress, who are new to the House or not already on record as favoring or opposing the Morrison reduction bill * * * When it is remembered, however, that only 90 of the 138 members interrogated were candid enough to answer, and that the men who dare not state their views in advance generally "go with the crowd," it is safe to predict that there will be no violent or radical change in the surface of things economic between now and 1887 —*Syracuse Evening Herald.*

The result of a canvass of the next House of Representatives on the tariff question, printed in yesterday's issue, has evidently had the effect of bringing about a feeling of greater security among business and industrial interests.—*Erie Dispatch.*

We have no doubt that the AMERICAN MACHINIST is in a general way correct in the conclusions drawn. There are, however, so many shades of protection views—as there are of free trade and tariff reform opinions—that its conclusions would, perhaps, be more accurately put in this form: "The incoming Congress will contain a positive majority of members who would agree in support of the Randall view of the tariff issue.—*Memphis Avalanche.*

The AMERICAN MACHINIST, by its stroke of enterprise, has laid the public under no inconsiderable obligation. It has obtained, through much effort, indubitable evidence that there will be a clear majority of protectionists in the Forty-ninth Congress, a fact for which the country may feel profoundly grateful. The assurance which this discovery gives cannot well be overestimated when the sensitive nature of the business of the country is considered.—*Daily Saratogian.*

The AMERICAN MACHINIST has done a good work for manufacturers by polling the Congressmen-elect on the tariff question. The replies published will go far towards restoring that confidence necessary for a successful business future.—*Watertown Times.*

It will be gratifying to the friends of a protective tariff to learn that these inquiries have developed the fact that there will be a clear majority of protectionists in the House of Representatives of the Forty-ninth Congress.—*Reading Times and Dispatch*

As all are not heard from, and this majority is therefore likely to be increased, we may assume that the free trade programme will not be carried out next winter.—*Poughkeepsie Eagle.*

If this estimate can be relied upon, and we see no reason to doubt the accuracy of its deduction, the manufacturers of this country may feel reasonably assured that the tariff laws will not be materially changed.—*Cohoes News.*

Upon the whole, the outlook for protection is not discouraging. The majority may be small, but a dozen is as good as a million when all are counted. —*Lancaster Examiner.*

The AMERICAN MACHINIST, a stout supporter of the protective tariff, set out some time ago to determine, if possible, the views of a majority of the next House of Representatives on this question. * * * Members, of course, have been known to change their minds, but the AMERICAN MACHINIST has certainly made out a strong *prima facie* case.—*Washington Evening Star.*

The figures upon their face bear the stamp of truth. We believe them to be correct; and we believe furthermore that the men over whose signatures those letters appear will stand true, shoulder to shoulder, and bound together by the closest tie; standing before the country, not as Republicans, not as Democrats, but as citizens, pledged to the support of the high and holy principle of protection to American labor, they will present an impregnable front. With such a phalanx ever ready for the defence of the public good, it will be impossible for the enemy to obtain a foothold. It will not only be a present defence, but for the future it will be a pledge of prosperity so enduring that no section of the country, however remote, will fail to feel the revivifying influence.—*Baltimore Morning Herald.*

It is of the utmost importance to know precisely what will be the complexion of the next Congress. This information is now obtained, and the friends of protection may rest assured that their cause is safe.—*Wilkesbarre Record.*

It has been ascertained by the AMERICAN MACHINIST that 167 members of the next Congress are in favor of the principle of protection—that is a majority of 9 out of the whole number. How much protection, or how little protection, these lawgivers are in favor of, and on what merchandise they would place an import tax protection, is just what no fellow can find out * * * * After all, the tariff is a local question, and the Representatives, as a rule, favor all the protection or all the free trade the interests of their "deestricks" demand.—*Pittsburgh Post.*

Hon. Wm. D. Owen, who will represent this district in Congress after the 4th day of March, makes this reply: "I favor a protective tariff. I do not favor a general and substantial reduction of the present tariff." If this is Mr. Owen's position on this question, we do not believe he will represent the sentiment of a majority of his constituents. We believe the sentiment of the people of this district favors a material reduction in tariff duties. * * * High protection stifles enterprise, because as long as all the people are taxed to support a few manufacturers, they are satisfied and restrict production to the home demand. Of course, there is no hope for tariff reduction for the next two years. —*Logansport Daily Pharos.*

To us it seems strange that such a result should have been accepted by so many well-informed newspapers. The weak spots in the AMERICAN MACHINIST'S arithmetic lie right on the surface. By no means every man who voted against the Morrison bill is in favor of protection. Some of the most strenuous opposition to that bill in and out of Congress came from revenue reformers, who thought the bill inopportune on the eve of an election, and wrong in its horizontal features. * * * The AMERICAN MACHINIST assumes too much when it counts against tariff reform all who opposed the Morrison bill, all Republicans, and such Democratic members as Wheeler. Perhaps when Mr. Carlisle shall be re-elected Speaker, its eyes will open.—*Montgomery (Ala.) Daily Advertiser.*

The classification is misleading, because the letters addressed to the members contain not only the question "Do you favor a protective tariff?" but also, "Do you favor a general and substantial reduction of the present tariff?" And while the answers received may be favorable to the general policy of protection in the proportion indicated, they do not convey with clearness the ideas of members as to where reductions in duties should stop.—*Washington Post.*

The tendency of the House is the important point to consider. If a majority of that body favors a continuance of the protective policy there is little ground of fearing a serious disturbance of the tariff. The facts that have been ascertained certainly indicate the newly-elected House to be of that character.—*Cleveland Herald.*

Of course the wish of the MACHINIST is father of its conclusions, and therefore they should be taken with a large allowance. It is very possible that a majority of the next House will not favor the method of tariff reduction proposed by the Morrison bill, but we are of the opinion that the demand by the people for a reasonable tariff revision and reduction will be heeded by a majority of the next House and such revision and reduction will be undertaken if there is a reasonable hope that they will be seconded by the Senate—*La Crosse Chronicle.*

As protectionist Weber says, "Something must be thrown overboard to save the rest." But when it comes to selecting the victim, as protectionist Gay says, the views of the victim's friends will be subject to modification with regard to the propriety of protecting the interests dear to the people who threw the victim overboard. —*Charleston (S. C.) News and Courier.*

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NEW YORK, MARCH 14, 1885.

CONTENTS.

	PAGE
New Stone Working Machinery	1
The Lehigh Valley Railroad Locomotive	1
Unbalanced Bodies in Revolution. By J. C Hoadley	1
Machine Shop Wages in Europe	2
Examples of Work Done on a Grinding Machine	3
Dickson Manufacturing Works	4
The New Hartford Drill Chuck	4
Early Engineering Reminiscences. By George Escol Sellers	4
McDaniel's Suction Fittting	5
New Little Giant Adjustable Die	5
Letters from Practical Men — Steel Shafts—"Re-working Steel" — The Eufaula Explosion—Still Another Plan for Cleaning the Flues of Upright Boilers—Hard-Running Line Shafts—Drill Sockets—A Steam Engine Difficulty	5, 6, 7
The Daily Press on the Protectionist Majority in Next Congress	7
The Safeguard to American Labor	8
Horrible Boiler Explosion	8
As Bad as Dynamite	8
Explosion Caused by a Hot Journal	8
Literary Notes	8
Questions and Answers	9
Manufactures	9
Machinists' Supplies and Iron	10

The Safeguard to American Labor.

The rates of machine shop wages in Europe, as reported by United States Consuls, which we present on another page this week, are worth careful attention. They are not taken from hap-hazard notes of tourists in those countries, but have been gathered at some pains by the paid representatives of our Government, residing where the information was obtained under direction of the Department of State, and have been published officially in a volume entitled "Labor in Europe." The figures may therefore be relied upon for greater accuracy than any others of like nature that have recently found their way into the public press. It will be seen that the highest wages are paid in Britain, and that they are considerably lower than the wages paid the same class of mechanics in this country. A comparison of the figures with those furnished by U. S. Consuls in 1878, makes it evident that wages have not advanced since that year, and it may be added that in several occupations there has been a decline. On the other hand, wages in some of the countries that have recently applied protective tariffs, notably in Germany, have advanced. But in the overcrowded countries of Europe the wages of mechanics will never be as high as those paid here, unless by stupid and blundering legislation American mechanics are brought down to a level and unguarded competition with the ill-paid drudges across the Atlantic.

"After all I have read, written and published to the world on the all important subject of a tariff," wrote the great philanthropist, Peter Cooper, to the Tariff Commission, "I come to the conclusion that it should give full and complete protection to what Daniel Webster calls the producing cause of all prosperity, which he says is, 'labor! labor!! labor!!!' This can only be accomplished by an amount of duties that shall equal the difference between the cost of a day's labor in our country as compared with the cost of a similar day's labor in other countries. The difference when carefully examined will be found to be on an average, in this country, of from fifty to one hundred and fifty per cent. more than what is now being paid for similar labor in other countries." The rates of wages as ascertained by our consuls bear out the above declaration.

The free traders try to persuade American workmen that the lower cost of living in Europe about compensates for the lower wages their workmen receive. This illusion is dispelled by the consuls' reports before us. In Austria and England especially, the cost the necessaries of life is not so much less than in the United States, "but when the mode of living is taken into account the difference becomes very striking."

It costs less to send machinery across the ocean than from New York to Chicago, and without a protective tariff the American mechanic would be ground down by competition to accept the miserable pittance paid to mechanics in Europe.

Horrible Boiler Explosion.

The deplorable apathy of the American public to loss of human life is strikingly illustrated by a horrible boiler explosion which happened at Brazil, Ind., on February 10. A boiler belonging to a battery of boilers used in a rolling mill exploded, killing eight men and injuring eighteen more so seriously that some of them will be maimed for life. Although no political or national topic is absorbing much public attention, this terrible explosion excited scarcely any comment from the daily press.

A friend has sent us a piece of iron cut from the exploded boiler, and it shows very distinct indications of overheating. In fact, there is little reason to doubt, from the appearance of this iron, and from the evidence elicited at the coroner's inquest, that the boiler was red-hot when the explosion occurred. The inquest was very intelligently conducted, and the self-proclaimed boiler expert, with a pet theory of explosions, was conspicuously absent. From the testimony given, it appeared that the boiler had been in use only four or five weeks, and that it was constructed of charcoal hammered No. 1 iron of 50,000 pounds tensile strain, made at Swift's Iron and Steel Works, Cincinnati, O. Experts testified that the iron was not very good, but that the boiler was capable of standing a pressure of 300 pounds per square inch, and that it was worked under a pressure of 60 pounds to the inch. The boiler was in charge of J. M. Hemphill, an assistant engineer, who was declared by an owner of the rolling mill to be perfectly competent, which his own evidence and that of his fellow-employes seem to gravely question. He went about his work in a manner that indicated he was not properly impressed with the importance of his duties, and the serious results likely to arise from neglect. The blame of the disaster has been placed upon this man's shoulders, but we believe a large share of the responsibility rests upon those who employed an incompetent man to perform very responsible duties, whose importance were under-estimated.

As Bad as Dynamite.

There is an upright portable boiler standing close to the sidewalk at the corner of Ninety-sixth Street and Third Avenue, New York, that illustrates in a striking manner how little public safety is considered in the way that dangerous appliances are permitted to stand beside crowded thoroughfares. This boiler is used to supply steam to rock drills that are at work breaking up the rock formation beside the street, and it also supplies steam to an engine that operates a hoisting crane. There is nearly always a crowd of children or grown people around the boiler, besides numerous workmen laboring within a few yards of it. If the condition of the boiler is in unison with its attachments, it is more dangerous than a loaded dynamite bomb would be. The water glass is broken and the plugs of all the water gauge cocks are missing, so that the man in charge probably has to guess at the height of the water in the boiler. The steam gauge freezes up every night, so that its indicator is likely to throw but little light upon the pressure of steam in the boiler. The safety valve is held down by a rod of crooked iron, to the end of which is attached by a wire an old butcher's weighing spring scale. Yet this concern is used to generate high-pressed steam, and is fired hard. Should it go to pieces suddenly from over-pressure or through the sheets getting burned, and kill a crowd of people, it will be declared an accident, when really it is the natural result of criminal recklessness for which the city authorities are responsible.

A well known machine tool builder, speaking of the use of cut instead of cast gears in cases where the latter might be passed, says that with the best automatic gear cutting machines it takes about the same time to cut gears that it does to trim and clean up the teeth of cast gears, so that it is nearly as cheap to use the former as the latter, with the additional satisfaction of having them run without noise or trouble.

The circular of inquiry from a committee of the Master Mechanics' Association on "the best metal for locomotive bearing," which we publish in another column, calls for more light on a subject that is very important in the regular and economical operation of railroad trains. The question of journal lubrication is still indifferently understood, and the subject is complicated by diverse opinions as to what metal is best suited for the hard usage to which bearings carrying the weight of locomotives are constantly subjected. The opinions respecting the best metal for and form of bearings are ridiculously conflicting, and are in numerous instances founded more on prejudice than on demonstated proofs of suitability. We trust the various master mechanics will give their experience freely, with the bearings they use, so that a report may be prepared that will indicate with some degree of certainty what form and material produce the best result.

Explosion Caused by a Hot Journal.

At the Hillman Coal Company's Mine at Wilkesbarre, Pa., there is a large fan used at the main shaft, for keeping up a circulation of air inside the subterranean workings. This fan performs extremely important functions; its duties are a matter of life or death in fact. One day last week the so-called engineer in charge of the fan-operating machinery, discovered that the speed of the fan was beginning to slow down. He went to the boilers that supplied steam to the engine to see if the fires had not got low, but they were burning all right, and the pressure of steam seemed by the gauge to be correct for proper working. This appeared to be a very mysterious case, for the speed still continued perceptibly to decrease. After marveling over the trouble for some time more, the so-called engineer happened round near the journals of the fan, and found one of them very hot, so hot indeed that the increased friction was gradually stopping down the whole machinery. Notice was then sent to the superintendent that the fan would have to be stopped, and he, realizing the danger of the case, sent word round among the miners at work to extinguish their lamps, as accumulation of explosive gas would at once follow the stoppage of the fan. The intelligence was not spread rapidly enough, however, for gas accumulated and found the flame of an unprotected lamp, and an explosion followed, which resulted in the death of several men and injury to others. The case is spoken of in Wilkesbarre as an unfortunate accident. It certainly was unfortunate for the men who were maimed and killed, and for their friends. But we cannot help wondering that affairs of the kind are not more common under the criminally reckless management apparent all round. Men, in charge of machinery that lives are dependent upon, who are not competent to run a machine higher than a wheel-barrow; and mines liable to fill with explosive gas, worked by miners whose lamps deride the word safety, it is a false pretense to call homicides happening under these conditions accidents.

Literary Notes.

A TREATISE ON THE CONSTRUCTION AND Use of Grinding Machines for Cylindrical and Conical Surfaces. As made by Brown & Sharpe Manufacturing Company, Providence, R. I.

Grinding machinery, in its present improved form, is not so generally known or appreciated as it should be. This book is prepared with great care, and by the aid of cuts, whenever necessary, the processes of grinding are very fully explained. Manufacturers in the iron industries will be well repaid for its perusal, and will be very likely to find information to their advantage in it, and mechanics generally will find something in it that will add to their general knowledge. It is neatly printed and artistically bound. Price $1.35.

ENERGY AND MOTION. A Text-Book of Elementary Mechanics. By William Plaice, M. A. Cassell & Co., Limited, Broadway, New York. Price 75 cents.

This little book treats of motion, force and energy in a plain, simple way that will be of great service to those trying to learn the principles of mechanics. The elementary works in this line generally assume that the student has an instructor at hand to elucidate the difficult parts. Professor Plaice assumes that the student will understand the subjects treated without other assistance than the book. The book is divided into two parts. The first treats of motion; the second of kinetics. Under the first heading there are chapters on electricity and acceleration; distance, velocity and acceleration; the principles of the parallelogram and the polygon, etc. The second part has chapters on force and mass; work and energy; moments and parallel forces; laws of motion, etc. Along with each chapter problems are given for

solution, the answers being put at the end of the book. Mechanics and engineers trying to help themselves into a knowledge of the principles of mechanics will find this book a great aid.

Before questioning the *new* members of the next Congress about tariff views we consulted several political almanacs (for 1885) to find a full list of the members elected. Every one of those publications contained what purported to be such a list, but the only *correct* list we found was in the *Tribune Almanac*, which sells at 30 cents a copy. The same accuracy seems to extend to the whole large fund of political information in this almanac.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(85) D. W. R., Terre Haute, Ind., will find the question of casting rolls or hollow cylinders discussed by a practical moulder in the Questions and Answers, AMERICAN MACHINIST, Dec. 20, 1884.

(86) C. S. M., Statesville, N. C., writes: Can you tell me how it is that an engine running on a curve when the outside rail is longer than the inside rail, gets round when the outside wheel has to travel farther than the inside wheel, both being securely fastened to one axle? *A.*—The inside wheel slips on the rail.

(87) F. L., Rochester, Minn., asks: 1. What is the best way of securing the wrist-pin in center crank disks? *A.*—Keying is the plan generally adopted, and is, perhaps, as satisfactory as any way. 2. Are disk cranks considered more desirable than solid cranks? *A.*—It is generally considered that they are not as likely to break, and the cast disks give an opportunity for counterbalancing.

(88) W. L., Brooklyn, N. Y., writes: We drive a set of rollers as follows: On first countershaft a 47″ pulley, belted to a 30″ pulley on second counter; on second counter, a 7″ pinion driving a 36″ gear. We wish to put a 30″ pulley on first counter, and a 10¾″ pinion on second counter. Will we lose power by doing so? *A.*—There will be no loss of power, but the belt from the 30″ pulley will only have about ⅝ the speed that it has at present, and to transmit the same power should be proportionately wider.

(89) S. O., Denver, Col., says: Can you give me a rule for properly proportioning the area of steam and water openings for siphons and injectors? Also head and pressure which it is necessary to overcome, and the water which can be thrown under known conditions? *A.*—The data here called for has been worked out experimentally by the makers of injectors and steam jets, but we are not aware that it has been put in any formula. We do not think any published work contains the information sought.

(90) J. R., Brooklyn, N. Y., writes: I wish to make a number of small castings, using 25 per cent. of nickel. Can you tell me of an alloy of this kind that will melt at a low heat; also how can I melt it? *A.*—Nickel is used with copper and zinc; sometimes a little tin is added. The proportions are about 50 parts copper to 25 each of zinc and nickel. In some cases a little lead is used. The melting can be done in any brass foundry, or they will furnish you with the castings at the foundry. These mixtures will not melt at a very low heat.

(91) A. W., Providence, R. I., asks: 1. What is your opinion of placing a heater between condenser and engine on a condensing engine, and what heater would you recommend? *A.*—There is economy in a heater thus placed. We cannot recommend one heater as against another. How much heating surface, and how much grate surface is allowed per horse-power where forced draft is used? *A.*—Practice differs widely in this respect. Perhaps a fair average would be about ⅔ that used for natural draft. In some instances much less is allowed.

(92) P. G. T., Hamilton, Ohio, asks: 1. Referring to the article in the AMERICAN MACHINIST of February 21, on "Balancing the Reciprocating Parts of Steam Engines," taking the figures to represent the driving wheels of a locomotive, would the amount of balance weight put in the trailing wheels equal the weight of the side-rod and crank-pin? *A.*—Practically the best counterbalance for locomotive wheels can be found only by experiment. 2. I would like to know how to determine the weight and diameter of fly wheel for any engine? *A.*—See AMERICAN MACHINIST of May 29, 1880, and May 13, 1882.

(93) E. U., Woodstown, N. Y., asks: 1. Can I straighten unannealed iron wire 1-16″ diameter by powerful tension? I wish to cut it into lengths of about 10″. *A.*—We do not think you can straighten it in the way proposed except by permanently lengthening it. We think by planing half-round grooves for the wire, in an iron plate, that by moving a heavy flat plate forward and back over it, you may straighten the pieces. See illustration of wire straightener in the AMERICAN MACHINIST of Nov. 26, 1881. 2. What can I use to fasten muslin to these rods, by wrapping it around? *A.*—A cement recommended for such purposes is made by adding 2 oz. of pulverized borax and 4 oz. of gum shellac to 1 qt. of boiling water, and boiling till dissolved. Perhaps shellac cut with alcohol, so that the whole will be quite thick, will answer.

(94) W. H. C., Knoxville, Tenn., writes: I have for experimental purposes made a small boiler, 10″ diameter, 18″ long, with a 4″ flue. It is made of a good quality of iron, well riveted; heads well braced. What pressure could I safely carry, and what would be the limit? *A.*—We assume the thickness of shell to be .05″, and the tensile strength of material to be 40,000 lbs. The ultimate strength of shell is, then,

$$\frac{.05 \times 40{,}000}{10} \times 2 = 400 \text{ lbs.}$$

Assuming a safe pressure to be one-sixth of this, it is 66 lbs.

(95) D. R., Boston, Mass., asks: 1. How can I find the proper length of a link for an engine having eccentric rods 15″ long; travel of valve, 1⅛″? *A.*—There is no rule for the length of link. You can, for convenience, make the points where the rods are attached to the link five to six inches apart, then in full gear the block will be against one or the other of these points of attachment, and the link must be long enough so the block will not strike the end. Strike the radius of link from the center of eccentric strap. 2. What size of engine, and boiler, and wheel would be suitable for a boat 23 feet long? *A.*—You neglect to give breadth of beam. Probably an engine 3″x4″ would answer; boiler, upright, 28″x42″; wheel, 18″ diameter and pitch. 3. What speed would I get at 300 revolutions? *A.*—If you turn the wheel at that speed there will be a good deal of slip. You may get a speed of 7 or 8 miles per hour. 4. Would anything be gained by gearing the engine? *A.*—No.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Katzenstein metallic packing, 169 Christopher st., N Y

Curtis pressure regulator and st'm trap. Feb. 21, p 15.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

The Young Engineer's Own Book, $3. Edw. Meeks, Publisher, 1002 Walnut St., Phila., Pa.

For Sale—26″ b. g. drill presses, quick ret'n bal. spindles, new, modern tools, $150. S. M. York, Clev'd, O.

Light fine interchangeable mach'y to order. Foot lathe catalogue for stamp. E. O. Chase, Newark, N.J.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Cooper, On the Use of Belting, $3.50. Edw. Meeks, Publisher, 1002 Walnut St., Phila., Pa.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

A few chucks, of all kinds, for sale at half price. Slightly damaged. Send for list to the maker, A. F. Cushman, Hartford, Conn.

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham St., N. Y.

Farley's Reference Directory of the Machinists, Iron, Steel, and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4.00; books for practical machinists. Address Joshua Rose, Box 3,306, New York City.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

Locomotive Engine Running and Management. By Angus Sinclair. Price $2. An excellent book for men interested in steam engineering, valve setting, designing valve motion, the care of the Westinghouse brake, etc. Published by John Wiley & Sons, 15 Astor Place, N. Y.

Useful Information for Steam Users—A 100-page pamphlet, on the care and management of the steam engine and boiler, with hints and rules for engineers and firemen. Every engineer should have this book. Send 25c. in P. O. stamps to the J. N. Mills Publishing Company, 145 Broadway, N. Y.

MANUFACTURES.

A wire nail factory will be started at Bridgewater, Mass.

The Kensington Engine Works, Philadelphia, Pa., will build a new boiler shop.

The Nashville, Chattanooga & St. Louis Railroad is building a repair shop at Dickson, Tenn.

Jacob May, 850 DeKalb Avenue, Brooklyn, will erect a $15,000 workshop, to make iron railing.

The Kelsey Cartridge Company, of New Haven, Conn., is building a new factory at West Haven.

Business prospects have much improved with the iron Mills and machine shops of Youngstown, Ohio.

The Bardstown (Ky.) Axe Handle Company will establish a factory, with new engine and machinery.

The Graham Manufacturing Company, Galt, Ont., will enlarge their manufactory of rolled twist drills.

The Ogden Engine Company, Chicago, intend to place a few more lathes in their machinery department.

The Skinner Cash Transmitter Company has been organized at Littleton, N. H., with a capital of $200,000.

A reduction of 40 cents on the ton in freight rates on pig iron from Chattanooga to New York has been made.

The Furguson White Company, of Robesonia, Pa., are erecting a new blast furnace. Estimated cost, $130,000.

John Barker, Greensboro, N. C., will build a tobacco factory 50x90 feet, three stories high, to run by steam power.

J. H. Wells has recently started a machine shop in Tampa, Fla., and will now enlarge and put in more machinery.

The Union Foundry and Machine Company, Catasaqua, Pa., will erect large and complete works during the coming season.

The Holly Manufacturing Company, steam pump manufacturers, Lockport, N. Y., has re-employed all the hands heretofore laid off.

The Co-operative Wire Company, of New Brighton, Pa., will erect wire works and employ about 75 hands. Estimated cost, $50,000.

The new appliances which are being put into the Edgar Thomson Steel Works, at Braddock, Pa., will throw 300 men out of employment.

The New Castle Plow Works, New Castle, Pa., will erect plow works at once; will employ about 50 men. Estimated outlay, $25,000.

There is a prospect for the establishment in Chattanooga, Tenn., of works for manufacturing skelp iron, especially for wrought-iron pipe.

It is reported that an agricultural implement factory will be erected in Harper's Ferry, Va., by the Hoyle-Jones Manufacturing Company.

The Indianapolis Rolling Mill Company, having abandoned the idea of making any more rails, will change to some other production this year.

Gus Koehler and others have formed a stock company at Newport, Ky., and will erect a building for the manufacture of a cavalry repeating rifle.

Some time during the coming season the Portland & Ogdensburg Railroad will erect repair shops at Portland, Me., and fit up with new machinery.

The Madison Oil Mills, Canton, Miss., Carroll Smith, president, will enlarge their plant to almost double the present capacity, and purchase new machinery.

Louis Schaefer has donated a site for the new Linton Cutlery Works, Canton, O. As soon as the weather will permit the erection of the works will be commenced.

Spencer & Barnes, of Buchanan, Mich., will erect a large furniture manufactory at Winchester, Ky., provided the city of Winchester will grant them exemption from taxes.

The new plow works at Canton, Ohio, will be 126x118 feet in dimensions, and will be known as the Seery Plow Works, from the inventor, a moulder of many years' experience.

The Berlin (Conn.) Iron Bridge Company has in the course of erection a new building 60x100 feet. At the recent annual meeting of the company it was shown to be in a flourishing condition.

The Hall's Engineering Company have recently made arrangements with Ripley & Kimball, of St. Louis, to handle their injector in that market. Their initial order is for $10,500 worth of injectors.

The Nes Silicon Steel Works, at Sandusky, Ohio, will be sold this spring by order of the court. There is talk of purchasing the property and converting it into a mill for the manufacture of nails from old rails.

Winsted (Conn.) manufacturers will raise money to bring the surplus water of Mad River to Long Lake for manufacturing purposes. It is expected to make Winsted a very desirable place for manufacturers.

The Bird & Baker Foundry Company, of Battle Creek, Mich., has been incorporated. Capital stock, $40,000. Arthur E. Baker, President, Toledo, Ohio, and Charles H. Bird, Secretary and Treasurer, Kalamazoo, Mich.

The MacKellar, Smiths & Jordan Company, of Philadelphia, Pa., formerly doing business as MacKellar, Smith & Jordan, has been incorporated for the purpose of manufacturing printing types. Capital stock, $630,000.

A new feature in the history of strikes must go upon record. Both Houses of the California Legislature recently passed resolutions of sympathy with the striking machine shop and iron workers of San Francisco.

The Alabama Great Southern Railroad Company have decided to increase their capital stock $1,000,000. A portion of this will be used in the erection of large machine shops at Birmingham, Ala., which have for some time been in contemplation.

The Hopkins Watch Tool Company, of Waltham, Mass., has been incorporated for the purpose of manufacturing fine tools, machinery and watchmakers' lathes. Capital stock, $20,000. G. F. Frost, President, and Caleb H. Van Norman, Treasurer.

Steel nails are becoming so popular that several nail factories have begun to make them. The iron workers, whose employment has been interfered with by the use of steel nails, have discovered that it takes fewer steel nails to weigh a pound than of iron nails.

The LaCrosse, Wallis Carriage Company, of La Crosse, Wis., has been incorporated for the manufacture of carriages, buggies, sleighs, and vehicles. Capital stock, $25,000. Giles R. Montague, LaCrosse, President; J. A. Edwards, Clinton, Secretary, and S. S. Burton, Treasurer.

The Car-Axle Thimble Skien Company, which is operated by a stock company, will commence work as soon as all the stock is taken. Their buildings, machinery, etc., will be located at Franklyn, Ky. T. M. Goodknight is president, and J. S. Black, secretary, both of Franklyn, Ky.

Hine & Robertson, 80 Cortlandt St., New York, is the name of a new firm formed to succeed F. A. Hine, and to act as general sales agents of the Kellam steam damper regulator. The sales to date of this steam appliance now aggregate over 10,000 in number.

Dean Bros. Steam Pump Works, Indianapolis, Ind., have orders for the pumping machinery—consisting of six dupiex steam pumps—for the new blast furnace at Dayton, Tenn. This furnace is being built by a company of Englishmen, headed by Titus Salt.

George E. Keith has contracted for the erection of a factory at Campello, Mass., in the early spring, south of his present factory. The building will be two stories high, 32 feet wide and 70 feet long, with a wing 50 feet long leading as far as the railroad. The factory will be used by S. E. Packard, for the manufacture of paper boxes for boots and shoes.

The *Cleveland Iron Trade Review* says: "The Lake Shore Tubular Axle Company, capital $100,000, was incorporated the past week. The works are located in this city. Following are the officers: President, Geo. S. Redfield; Vice-President and Treasurer, Chas. H. Cromwell; Secretary, Edgar Peckham. The specialty of this new Company will be the Peckham Self-Lubricating Tubular Axle, from 20,000 to 25,000 pairs of which will probably be made the first year.

The New York Engineering Company, a new concern, have taken a store at No. 64 Cortlandt Street, New York, where they will do a general engineering business. The officers of the company are mechanical engineers, and control a large foundry and machine shop in the vicinity of New York, and will design, construct and sell, as first hands, all work not kept in stock. John A. Caldwell is secretary of the company, and will manage the general business of the store.

Melvin Stevens, 41 Dey Street, New York, is doing a good business in the sale of his planer chucks, which are largely used in Government shops, both in this and foreign countries. These chucks are made with or without graduated swivel base. An excellent feature of these chucks is the taper attachment, which, in use, adjusts itself to the taper of the piece to be held. Only one screw is used for closing the jaw, which has large range of opening. The wearing parts, including the screw, are exceptionally well protected from dirt and chips.

It is reported that Simpson, Hall, Miller & Company, of Wallingford, Conn., manufacturers of britannia hollow-ware, have bought 3,000 gross of silver spoons from Brown Bros., of Waterbury, who have abandoned the manufacture of that class of goods. This sale is, perhaps, the largest of the kind ever consummated, covering goods valued in the neighborhood of $200,000. A large proportion of the goods were plated, and a good judge estimates the quantity of pure silver on the goods at over a ton, worth $40,000.—*Boston Commercial Bulletin.*

E. Gould & Eberhardt, Newark, N. J., have recently put in the market a 20″ swing lathe, which is between the sizes usually built by them. It has a five-change cone, and an arrangement for using the head gear for cutting screws of coarse pitch, which greatly increases its capacity in this respect. The long screw which they got from Whitworth, cut from his master screw, is mounted, and will be used in cutting several master screws for their own use, and will then be dismounted and preserved as a standard. They are quite busy in the works on orders very generally distributed over the country. Some changes made in their shops add to their facilities for doing work.

Machinists' Supplies and Iron.

New York, February 26, 1885.

The condition of the supply trade continues unchanged.

Iron—The condition of the market for pig remains about the same as it has been for several weeks. The demand is light, and buyers are very exacting as to quality, and still persist in fighting down prices. Sellers occasionally make concessions to obtain business, but this is done with much reluctance. We quote standard Lehigh brands $18 to $18.50 for No. 1 X Foundry; $17 to $17.50 for No. 2 X at tidewater; and $14.50 to $15.50 for Grey Forge at furnace.

Scotch Pig continues dull, with only small sales reported. We quote Shotts at $21.50 to $21.75, to arrive; Coltness, $21.50 to $21.75, to arrive; Glengarnock, $19 to $19.50, to arrive; Gartsherrie, $20.50; Summerlee, $20.50; Carnbroe, $19, to arrive; Eglinton, $18.50; Langloan, $21; Dalmellington, $19.

Copper—The market for ingot has ruled steady, although sales have been light. Lake has sold slowly at 11⅛ to 11¼ cents. Other brands are quoted at 10⅛ to 10¾ cents.

✲WANTED✲

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Situation wanted by good machine patternmaker. Address "P.," Am. Machinist.

Situation wanted by an iron foundry supt. or foreman. Adddress Iron Founder, Am. Machinist.

Job by practical moulder. Loam, dry, or green sand. Good refs. Western or Southern States preferred. Address "Moulder," Am. Machinist.

A practical toolmaker wants position. Expert on dies and tools for sheet metal goods. Address Box 108, Port Chester, N. Y.

Mech. engineer, of good address and experience, wishes to travel part time for good firm. Address Box 2, Am. Machinist.

An experienced engineer desires a position as chief draftsman or superintendent. Address N. S. S., Am. Machinist.

Wanted—Dredge and derrick men, able to work the Pound Mfg. Co.'s dredges on the Isthmus of Panama. Address Franco American Trading Company, Limited. 53 Broadway, New York.

A position to travel with a line of steam goods by a man who has had ten years' experience, and can give unexceptionable references. Address Box 5 Am. Machinist.

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The boilers are to have an easy capacity to evaporate eighteen thousand pounds of water per hour from feed water at 125° F. to dry steam at eighty pounds' pressure, using bituminous slack coal. They are to be, in every particular, first-class in design, material and construction, and will be held rigidly to fulfill the specified conditions, tests, and inspections. Each boiler is to be capable of separation from all the others, so as to be fired or cooled without interfering with the working of the others The stack is now standing (brick)—height above grate level, 100 ft. Area of flue, 20 sq. ft.

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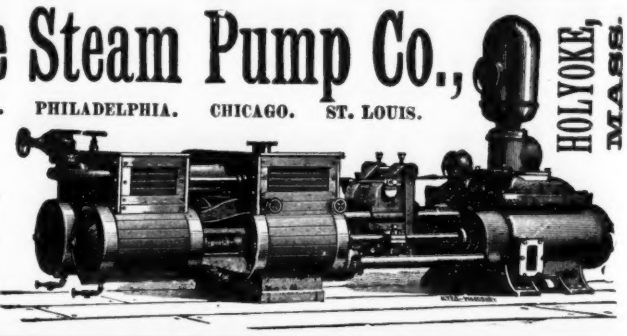

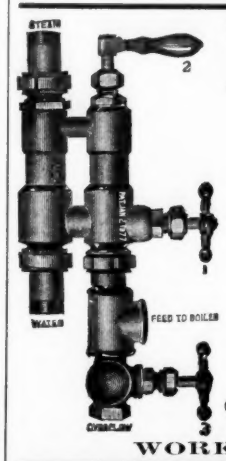

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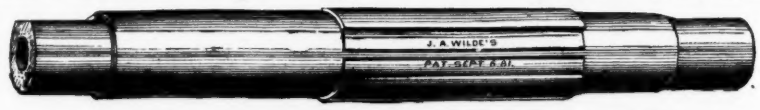

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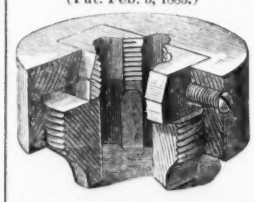

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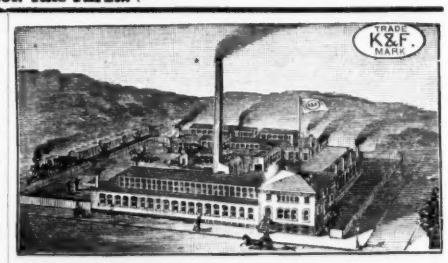

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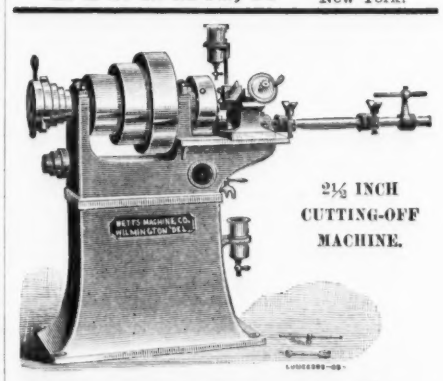

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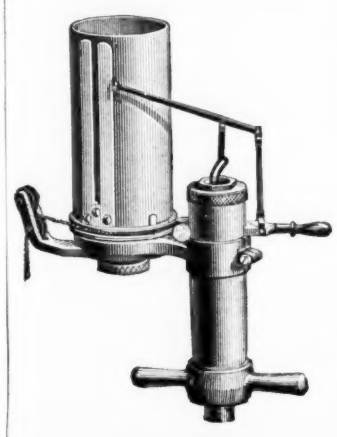

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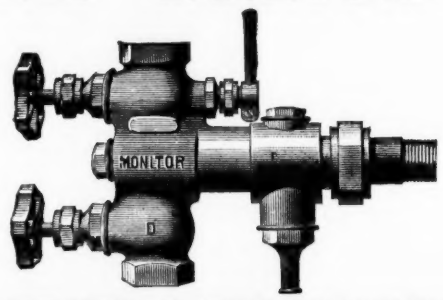

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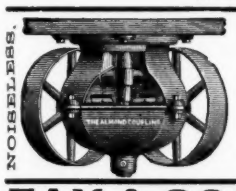

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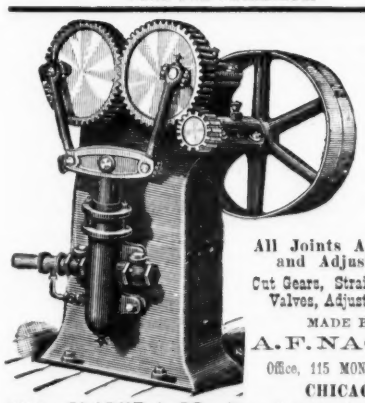

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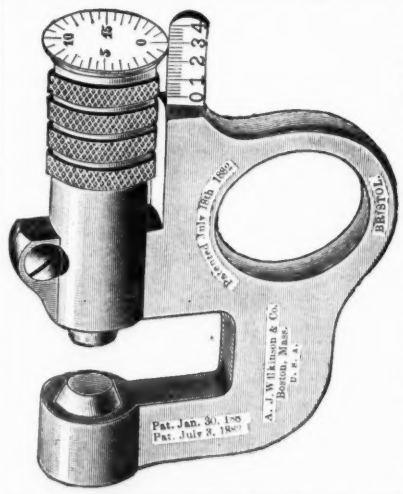

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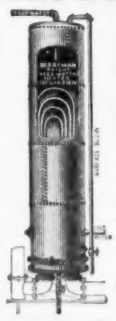

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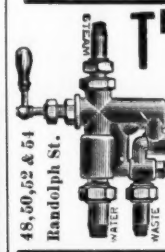

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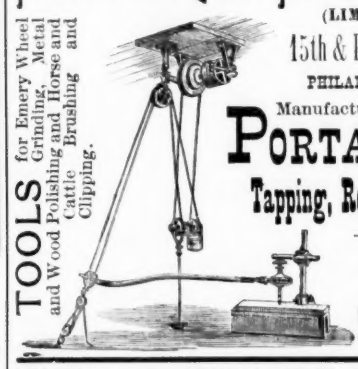

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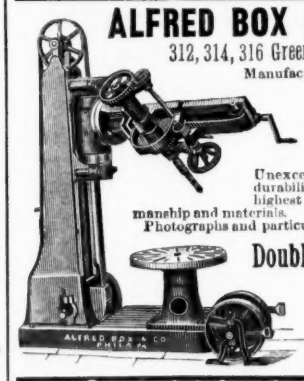

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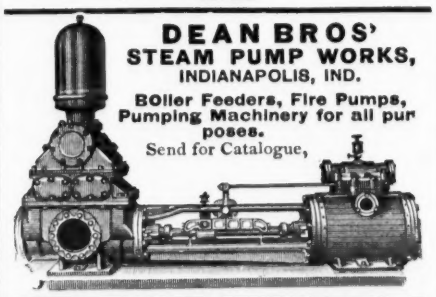

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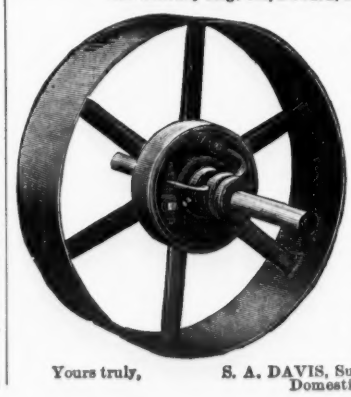

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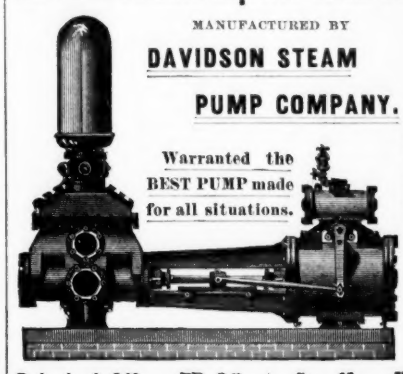

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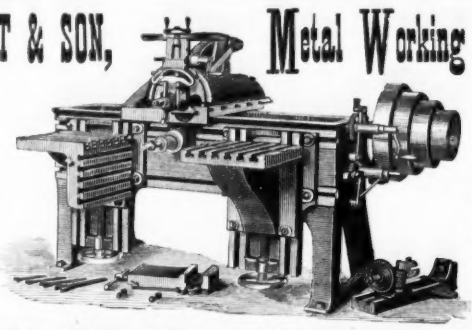

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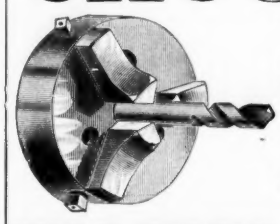

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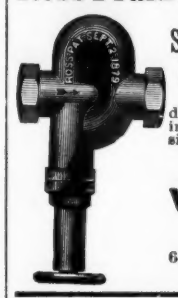

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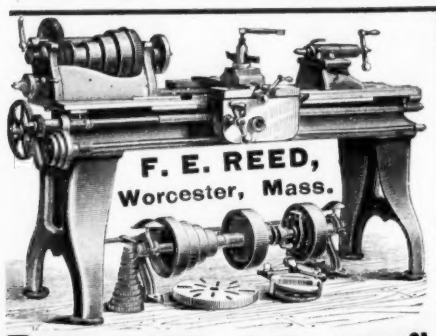

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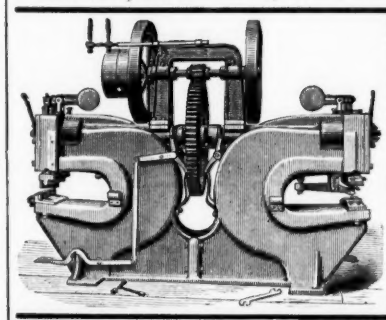

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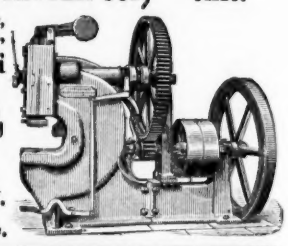

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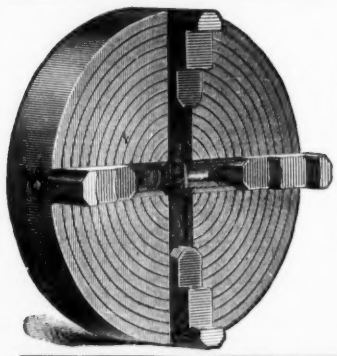

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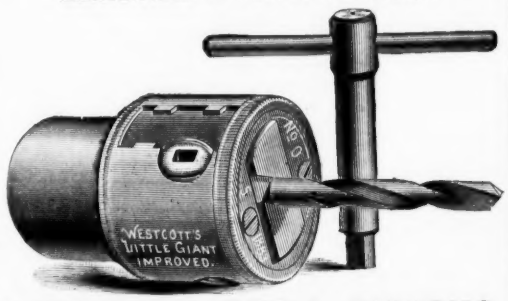

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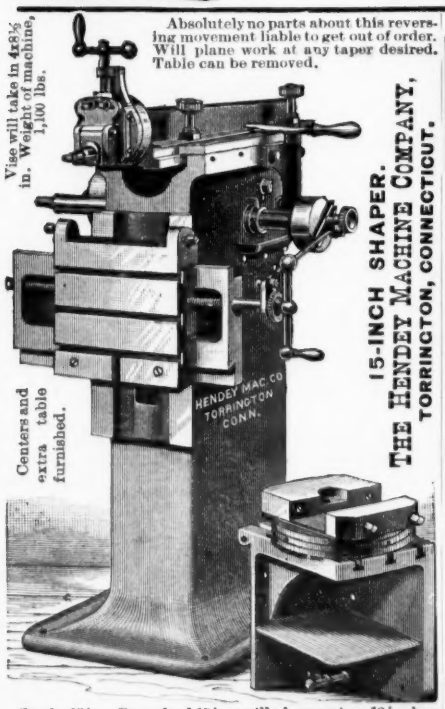
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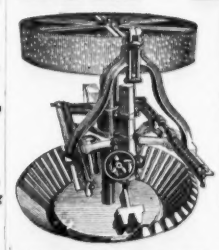

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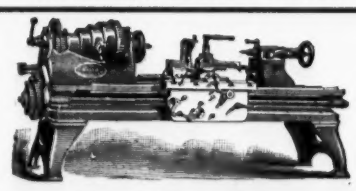

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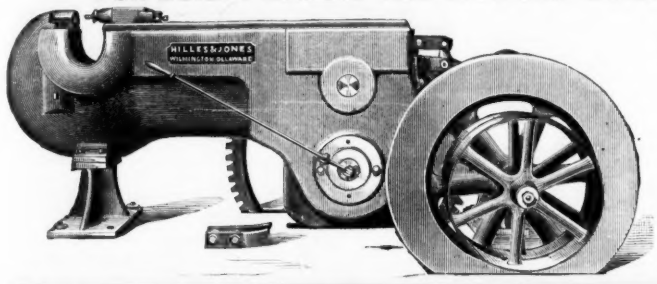

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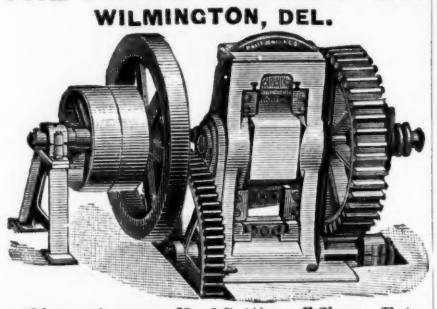

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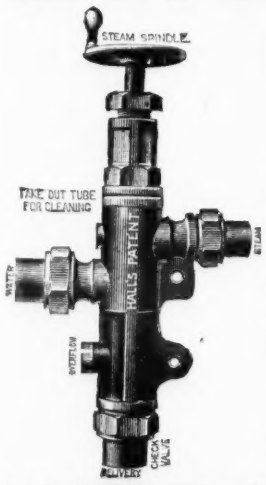

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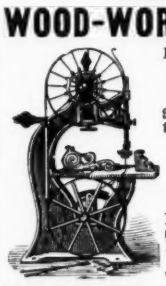

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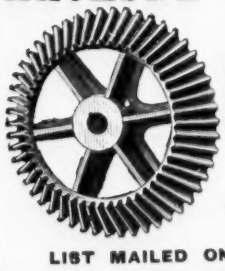

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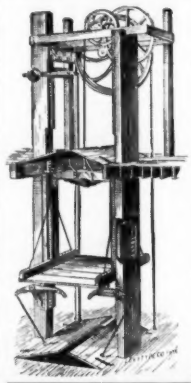

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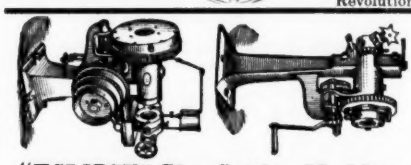

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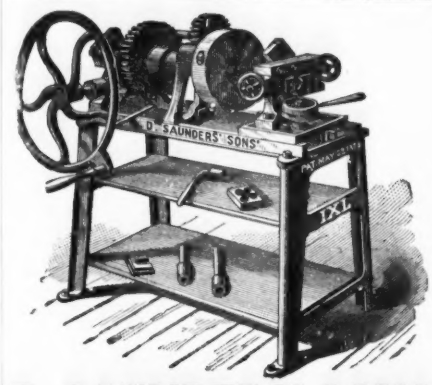

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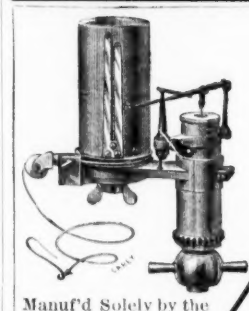

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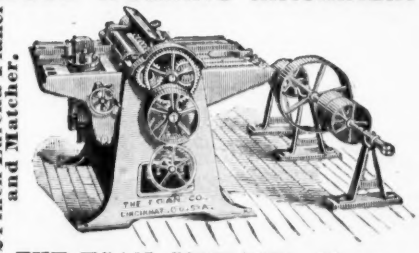

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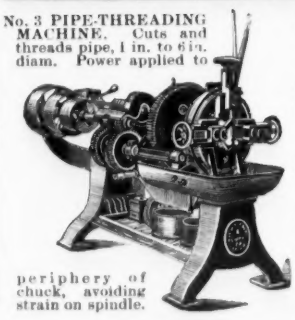

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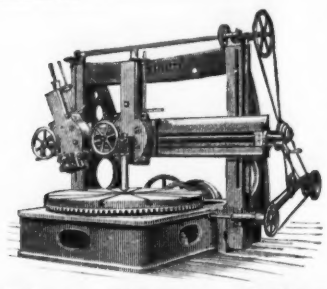

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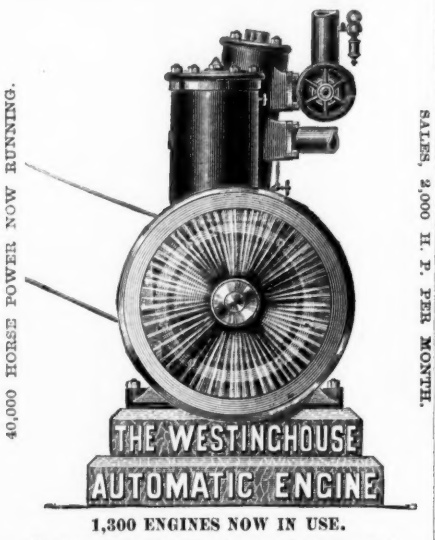

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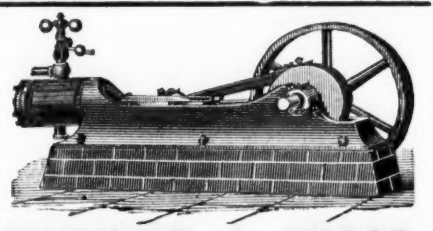

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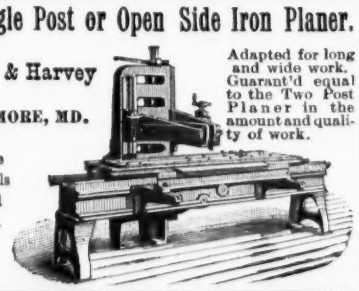

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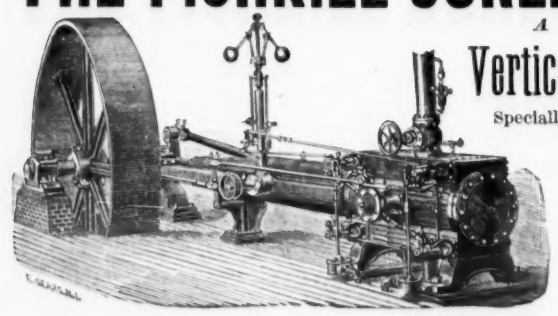

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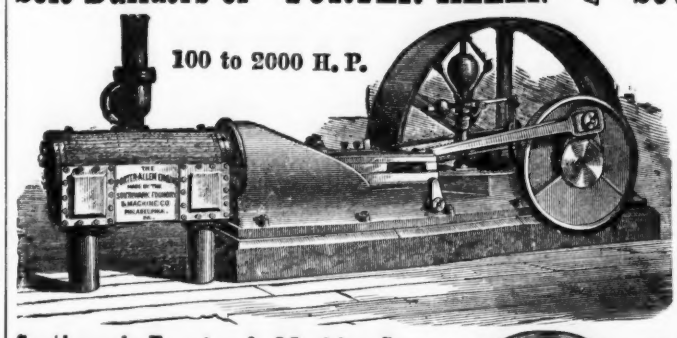

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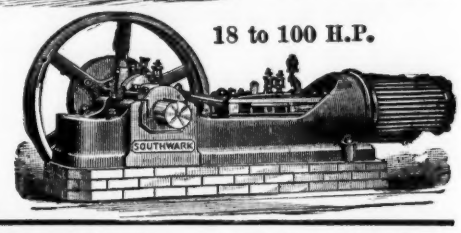

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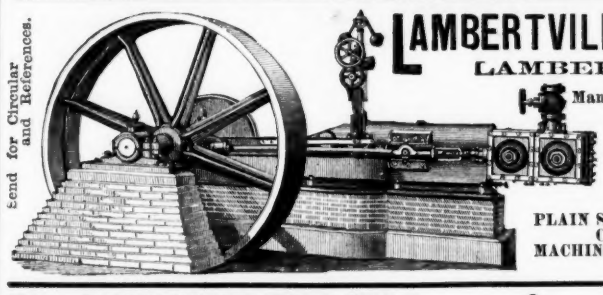

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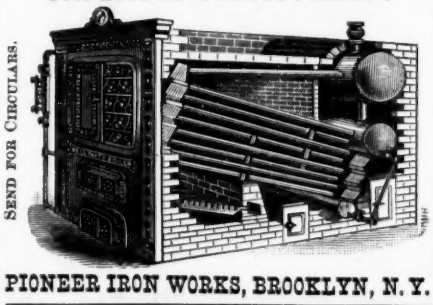

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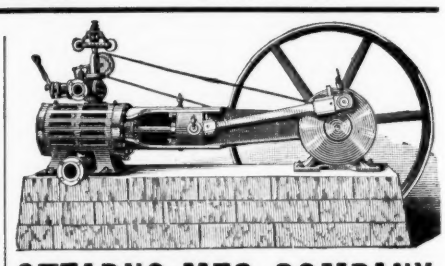

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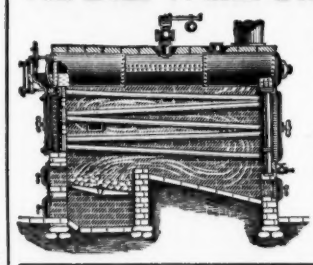

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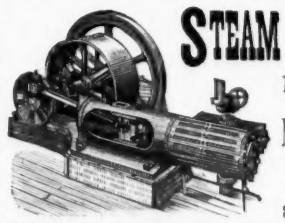

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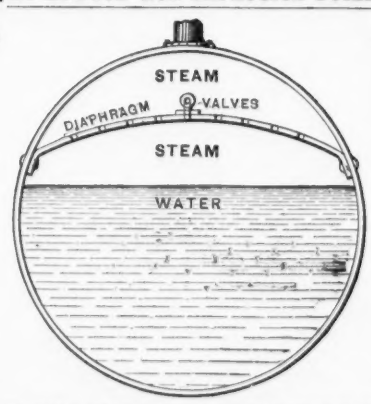

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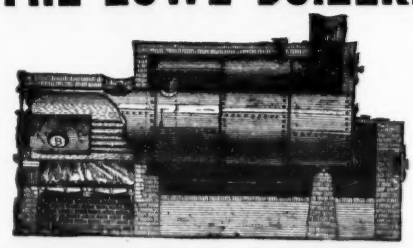

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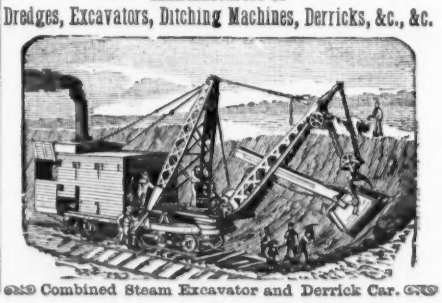

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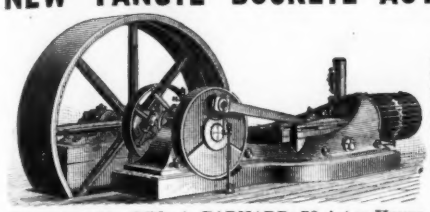

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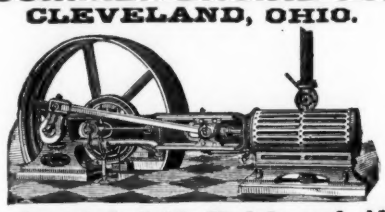

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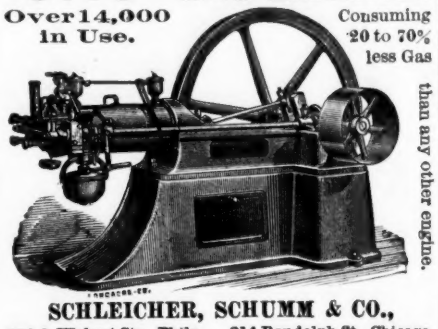

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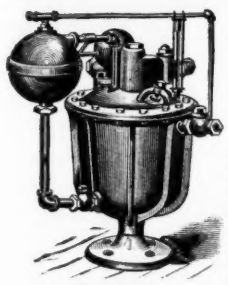

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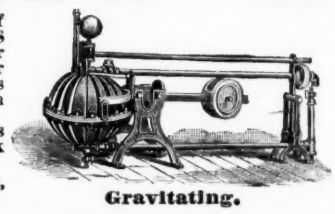

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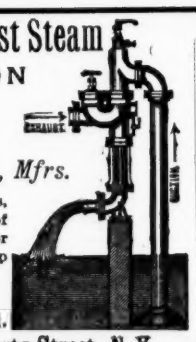

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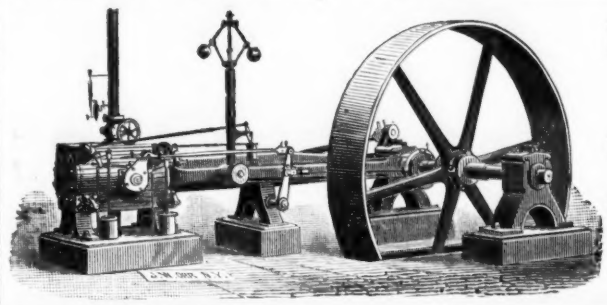

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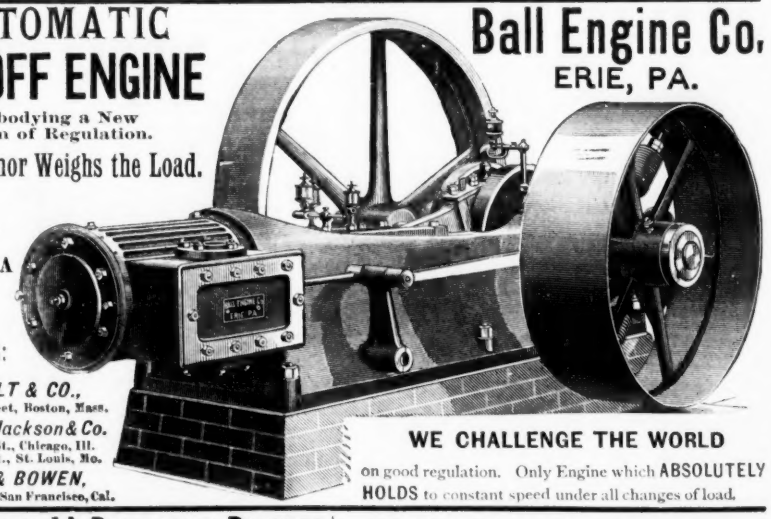

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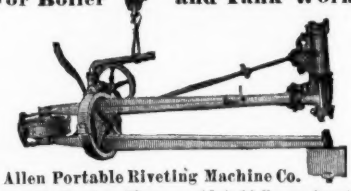

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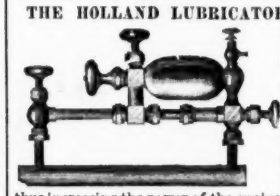

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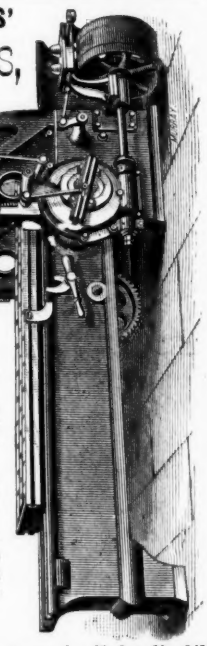

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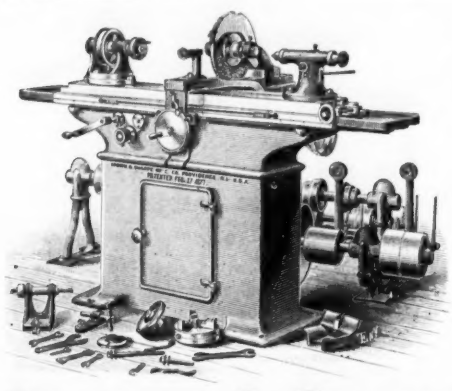

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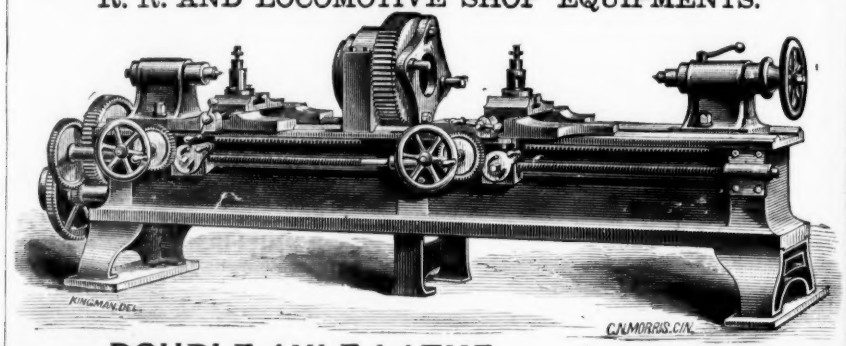

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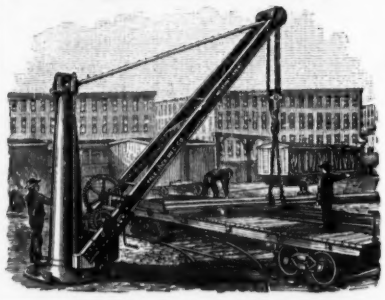

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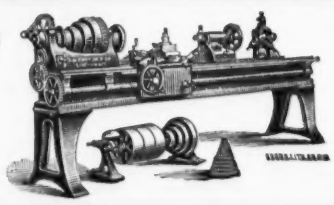

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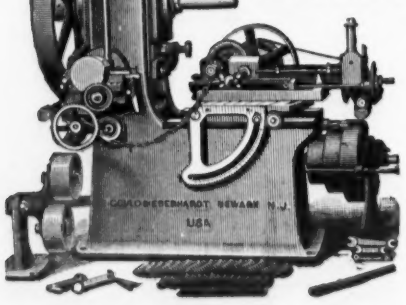

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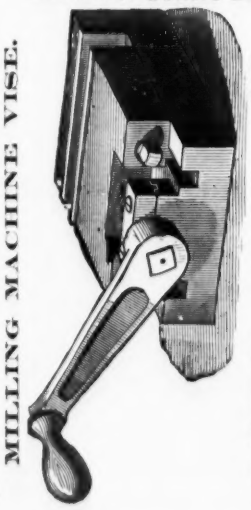

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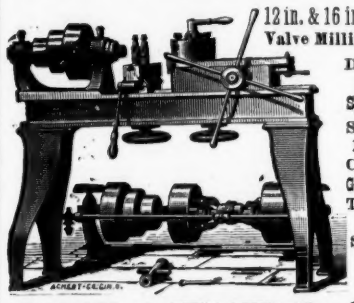

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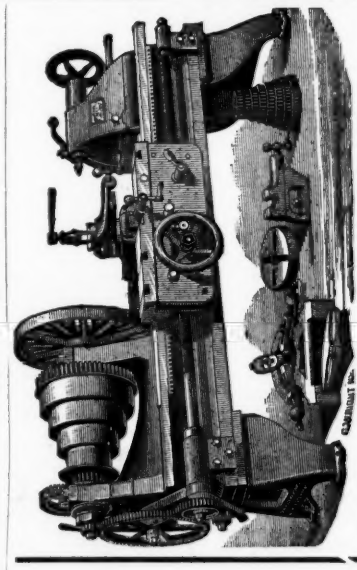

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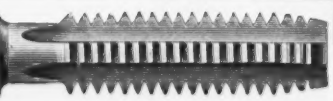

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